REPORT NO. 71-6192-1
CR-123496

TEKTITE II
HABITABILITY RESEARCH PROGRAM

January 14, 1972

Prepared under Contract No. NAS 8-25100 by
AIRESEARCH MANUFACTURING COMPANY
A Division of The Garrett Corporation
Los Angeles, Calif.

for Marshall Space Flight Center

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

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TEKTITE II
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By

D. P. Nowlis, Ph.D,

E. C. Wortz, Ph.D., and H. Watters

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CONTENTS

ILLUSTRATIONS

TABLES

SUMMARY

Multi-level parameters relating to perceived life quality in an isolated research and residence quarters were measured using a variety of tests. The habitat under study, emplaced beneath the sea off the coast of St. John's Island as a part of the Tektite II program, was being used for marine research. The crew for each of the 10 missions consisted of one engineer and 4 scientists. One mission had an all-female crew. Mission length was either 14 or 20 days, and 4 engineers, in covering 6 missions, stayed in the habitat for periods of 30 days each. A personality test was taken before confinement in the habitat. Two attitude tests were filled out by the aquanauts while they were still in the habitat. Daily moods were monitored during all missions. Special observations were made of leisure time use. Standardized private debriefings were administered at the end of each mission to each aquanaut. Other behavioral observations made by another research team were intercorrelated with the other measures described above.

The results indicate that the degree of task support available in the habitat was highly emphasized by the aquanauts. In general, the habitat was found lacking in this respect. Other results indicated a tendency for moods to become flat and dull over more prolonged mission duration, along with a decrease in positive attitudes toward the habitat and a decrease in percent time spent working. It was also found that positive moods correlated positively with positive attitudes toward the habitat and with higher percent time spent working, while negative moods correlated with indexes showing lack of adjustment to the habitat and the work routine. Intelligent and open personalities showed more observable work in the habitat. Having free choice in the selection of food to be served during the mission markedly decreased the number of complaints about food. Privacy, variety, and leisure time were valued more by the aquanauts than had been expected. The most-missed leisure activities were related to the aquanauts' families and sexual activities. The most valued leisure activities in the habitat were reading books and listening to audio cassettes. The most popular leisure activity was short-duration, non-mission-relevant conversation. Women acquanauts showed positive adaptation to the habitat in all respects, but there were not enough of them to analyze these results statistically. The tests used as habitability measures were as brief, non-intrusive, confidential, and meaningful as possible. It was found that it was possible to employ these habitability measures even during on-going research programs under intense time pressure.

SECTION I

INTRODUCTION

This document describes the background, methods, procedures, and results of an empirical attempt to explore the habitability of an isolated undersea research and residence quarters, and represents a part of a larger scientific project known as Tektite II. A description and summary of the experimental findings of the full Tektite II endeavor is contained in a report issued through the Department of the Interior. A detailed description of the actual day-by-day program, including operating procedures, safety criteria, and work plan, is contained in the "Tektite II Program Plan", another document published by the Department of Interior.

The primary objectives of the Tektite II program were to:

(1) Provide marine scientists with unique opportunities for underwater research so they might gain more information on the characteristics of reefs and their associated fauna and flora.

(2) Stimulate the growth of ocean sciences and technology, particularly in the area of man in the sea.

(3) Generate research data on human behavioral dynamics and habitability assessment for small crews in confined living spaces.

The Tektite II Habitability Assessment Program was a joint effort between the AiResearch Manufacturing Company, a division of The Garrett Corporation, and the Marshall Space Flight Center of the National Aeronautics and Space Administration, under NASA contract NAS 8-25100. This research program on habitability, including the report that follows, has been a part of the third program objective of the Tektite II project.

BACKGROUND

In one decade, United States manned space flight has progressed from the suborbital flight of astronaut Alan B. Shephard to the current series of lunar journeys. It is difficult to chart the course of development in the coming decades, but some assumptions can be made:

(1) Manned space flight will continue

(2) Crew sizes will probably increase

(3) Missions, whether interplanetary or earth orbital, will increase in duration

(4) Crews will be composed of individuals of varied nationalities and professional backgrounds

(5) Women will be in space

(6) Missions will become less and less exploratory and more and more operational or scientific

(7) An element of hazard will remain

(8) Quarters will always be confining

(9) Crewmen will be isolated for long periods as a group from earth and from many earth pastimes

Since it always will be important to assure the most effective possible missions for the dollars invested, it is important to determine what the effects of such parameters will be on mission operations and mission success.

Questions that led to National Aeronautics and Space Administration (NASA) interest in the Tektite program include:

(1) Where does one turn for guidance in the design of extended-mission spacecraft?

(2) How can we assure that crewmen are provided with a habitat that supports their mission and helps provide for their continued well-being?

(3) In short, how does one design for habitability?

To date, NASA has explored various analogs to space missions. The Tektite II program provided an opportunity to begin study of subjective and behavioral effects of long-term stays in a mission-oriented and isolated habitat. This habitat is described in Section 2. The Tektite II program plan involved 5-member crews staying below the surface of the ocean for periods varying from 14 to 30 days. High-level professional marine scientists carried out the research in the roles of aquanauts. One crew consisted of all women, and another was highly international in composition. While in the habitat, aquanauts were isolated from direct contact with any other human beings, and it was necessary for them to spend approximately 23 hours in decompression before it was possible for them to return to the surface. This plan of operations is further described in Section 2.

The literature pertaining to psychological effects of habitats was reviewed and a battery of relevant tests assembled. Some of the tests that were assembled had to be specially designed for the project, while others were selected from various sources in the professional literature. This aspect of our program is further described in Section 3 and in the appendixes. Because of the need to specify empirically as many of the factors involved as possible, a battery of assessment techniques that incorporated a large number of variables was deemed desirable.

HABITABILITY RESEARCH OBJECTIVES

Since the ultimate aim of habitability research in this instance was the formulation of criteria that will assist in the design and evaluation of isolated, research-oriented habitats, study efforts were focused toward answering the following specific questions:

(1) What are the key background variables and contextual variables that enhance or degrade habitability?

(2) Can measures of habitability be developed?

(3) Can such measures be used in an isolated habitat during actual research missions?

(4) How important or desirable is privacy? How important is the provision of variety?

(5) How important is leisure time? In what kinds of activities do off-duty crewmen engage?

(6) How important is food to habitability? What do crewmen enjoy and what do they complain about?

(7) To what extent do work provisions influence overall attitudes toward the habitat?

(8) How do crew reactions to the habitat change with increased mission duration?

(9) How is the personality of a crewman related to his opinion of, or adaptation to, the habitat?

(10) Do engineers and scientists view the habitat differently?

(11) Do men and women view the habitat differently?

(12) In improving the habitability of future isolated research and living quarters, where must attention be focused?

The methods designed to investigate the above questions are discussed in Section 4. The results are presented in Section 5. More complete answers were possible for some of these questions than for others; a degree of insight was gained for each. The most basic questions were the first three, because of the novelty of the approach in empirical psychology, and because observations on the other nine questions were to some extent dependent upon the success of answering the first three.

SECTION 2

HABITAT AND UNDERWATER MISSION DESCRIPTION

Both Tektite I and II programs were conducted in Lamashur Bay on a sheltered southern area of St. John's Island (the valley where the base camp was located and the head of Lamashur Bay are shown in fig. 2-1). A causeway was built at the head of the bay where boats could dock to unload supplies. The supplies could then be trucked to the base camp half a mile up the road. The causeway was also used as a starting point to take personnel and supplies to the support barge above the habitat (fig. 2-2), dive platform and decompression chamber (fig. 2-3), and command van and behavioral observation van (fig. 2-4) located near the southeast tip of the bay. The Virgin Islands Ecological Research Station provided the base camp facilities used by support personnel (the main dining and meeting hall is shown in fig. 2-5).

The research habitat itself consisted of two vertical cylinders standing on a base and interconnected by a tunnel (see fig. 2-6). Each of these two habitat pressure hulls had a maximum dimension of 12.5 ft. in diameter and 18 ft. in height. Each vertical cylinder was divided into an upper and lower compartment. In one cylinder the lower compartment contained the crew quarters, which included the cooking, sleeping, eating and nonmission communications equipment. The upper compartment contained the habitat bridge with its station monitoring, communication, and scientific mission equipment. The interconnecting tunnel on this upper level led to the engine room in the second pressure vessel. This compartment contained environmental control equipment, electrical power equipment, a food storage freezer, and the toilet. The lower level housed the wet room, which in addition to being the normal ingress-egress from the habitat contained storage volume for diving and mission equipment and facilities for biological specimen preparation. The overall interior arrangement is depicted in fig. 2-7.

The habitat contained six 2-ft dia plexiglass hemispherical windows. These windows were located strategically around the habitat to provide almost 360-deg visual inspection of the surrounding water and ocean floor. The hemispherical windows were for scientific, recreational, and diver safety observational use. An observation cupola was mounted on top of the equipment room with access gained by ladder. This elevated viewing tower had windows around its circumference that provided full 360-deg visibility.

Normal entry into the habitat was provided by an open, 4-ft-dia entry trunk in the wet room. A normally closed 3-ft-dia hatch in the crew quarters was available for emergency underwater egress.

The environmental control system (ECS) provided a viable environment within the Tektite II habitat by monitoring, regulating, and controlling the pressure, temperature, humidity, purity, and composition of the internal atmosphere. In addition, the ECS provided air for charging scuba tanks, emergency breathing, and habitat purging.

Figure 2-1. Overall View of Head of Lamashur Bay Showing Valley Where Tektite II Base Camp was Located and Causeway

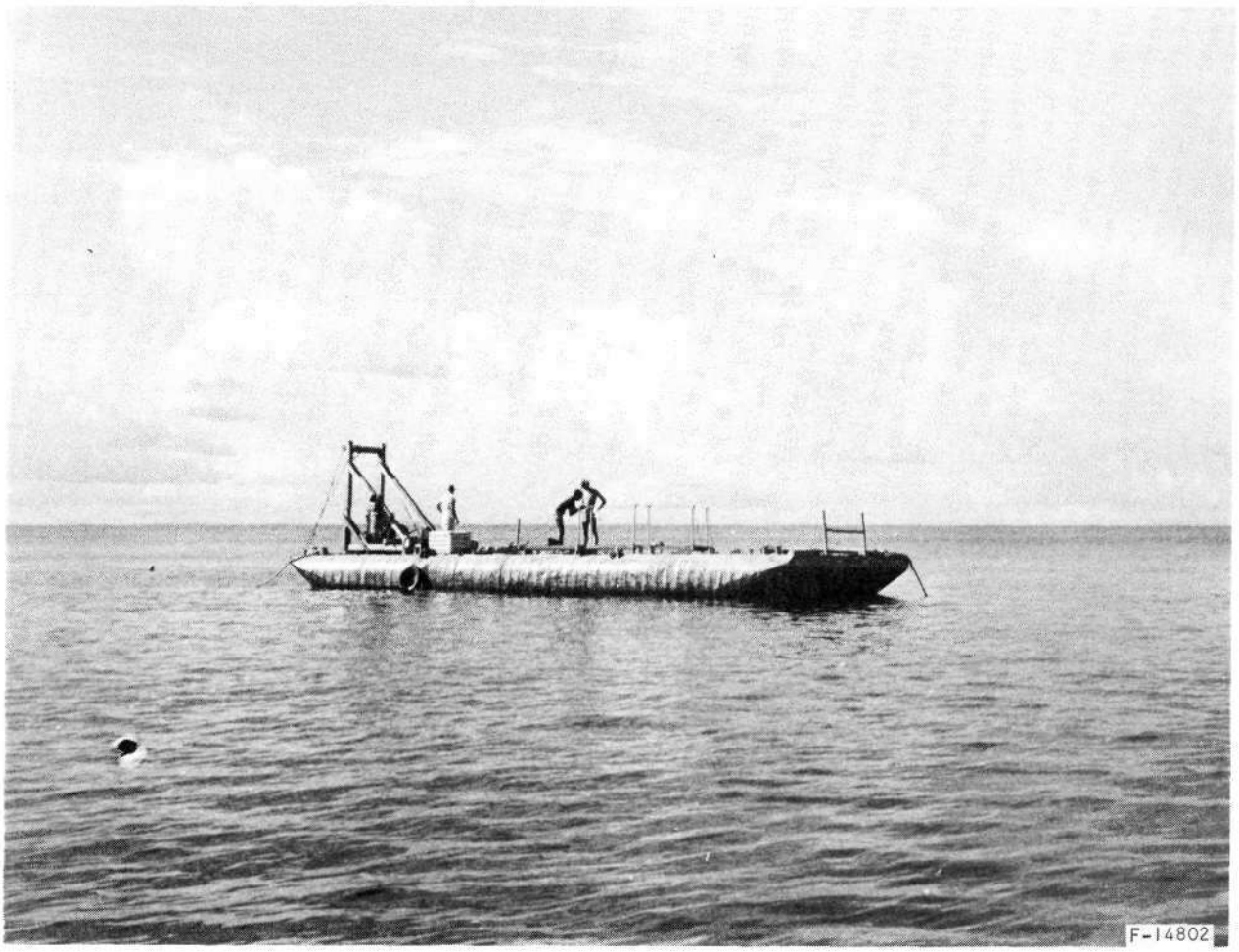


Figure 2-2. Tektite II Support Barge Located Over Habitat

NOT REPRODUCIBLE

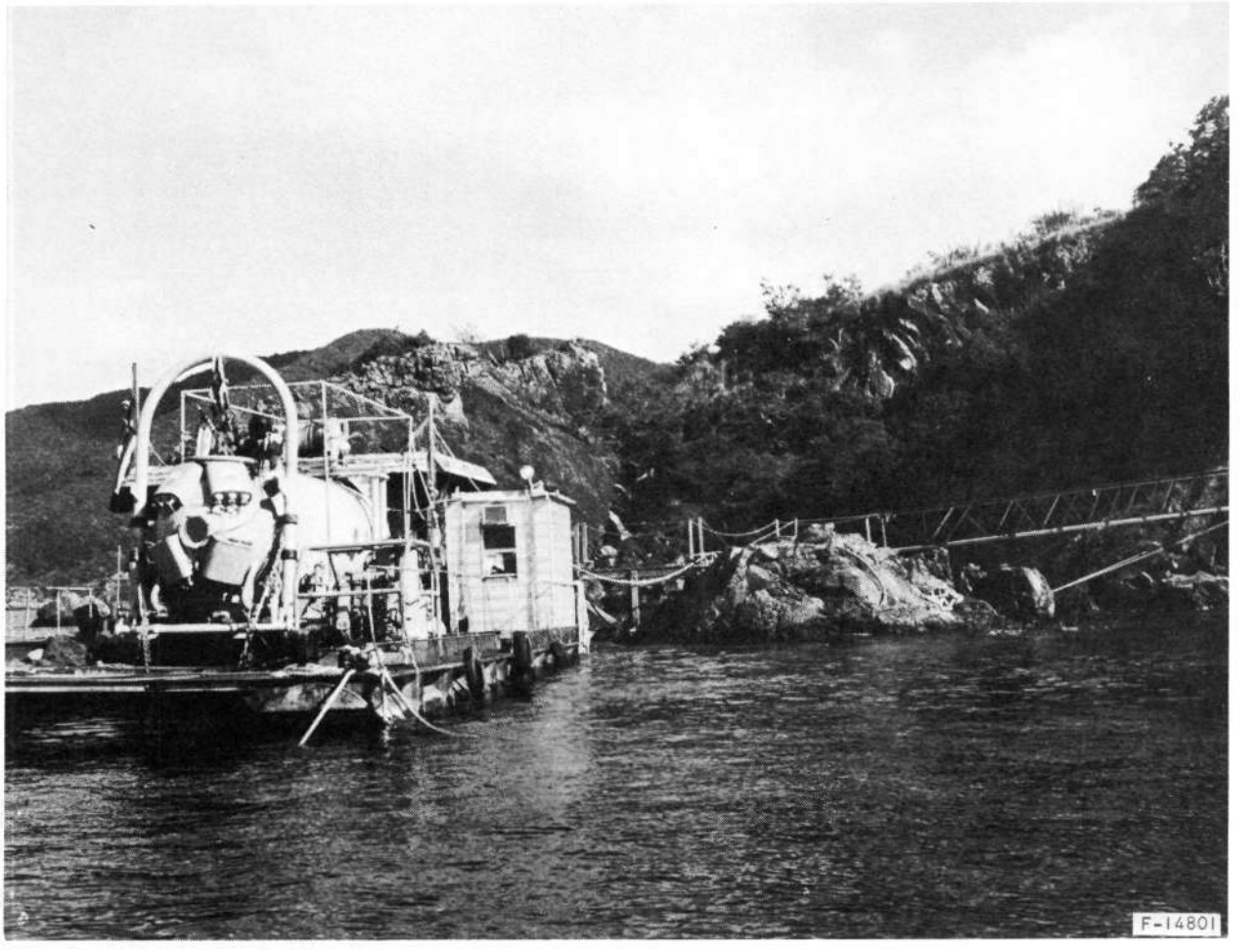


Figure 2-3. Tektite II Dive Platform and Decompression Chamber

Figure 2-4. Tektite II Dive Platform, Command Van, and Behavioral Observation Van

Figure 2-5. Tektite II Base Camp Facilities

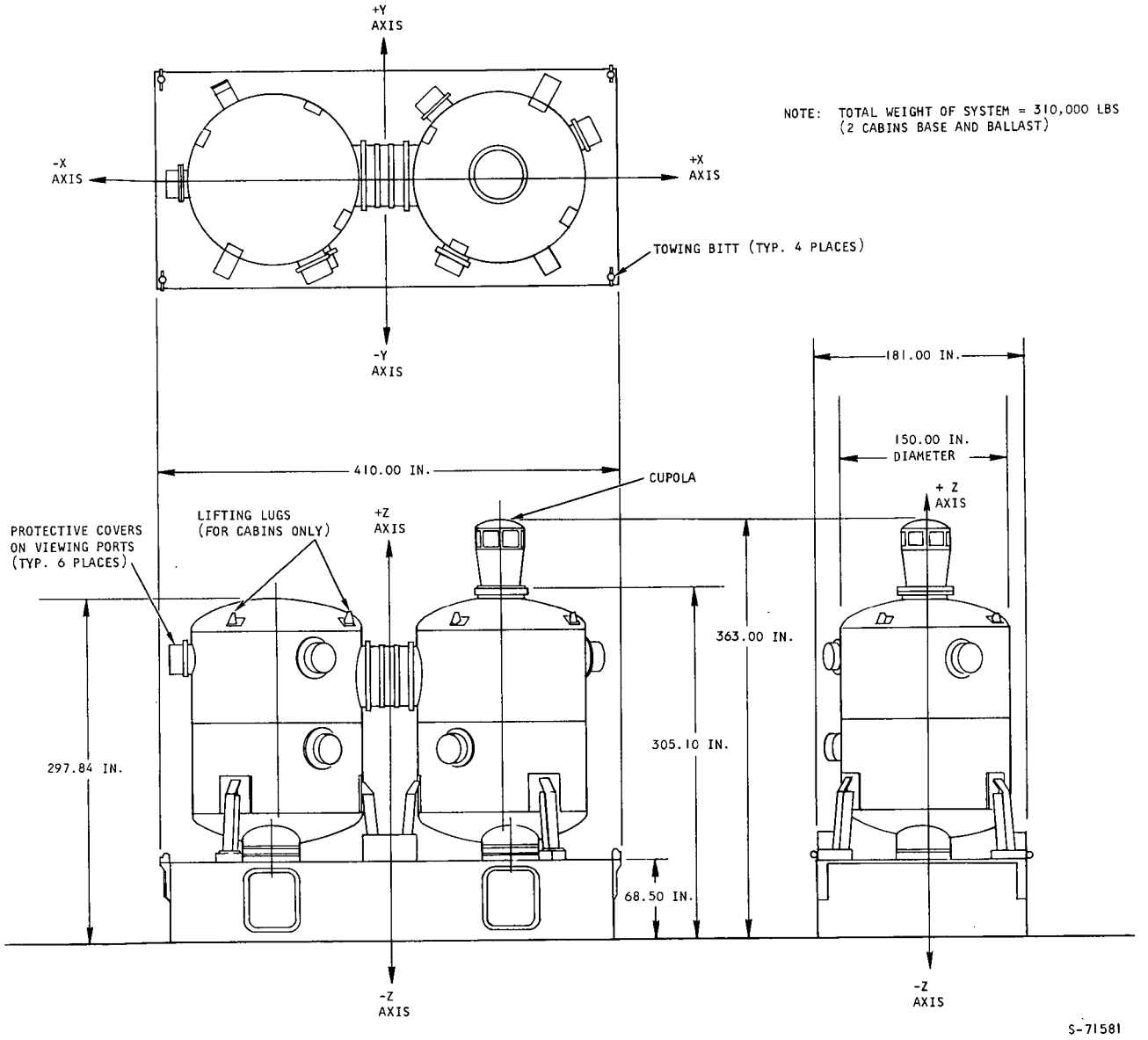


Figure 2-6. Tektite II Habitat

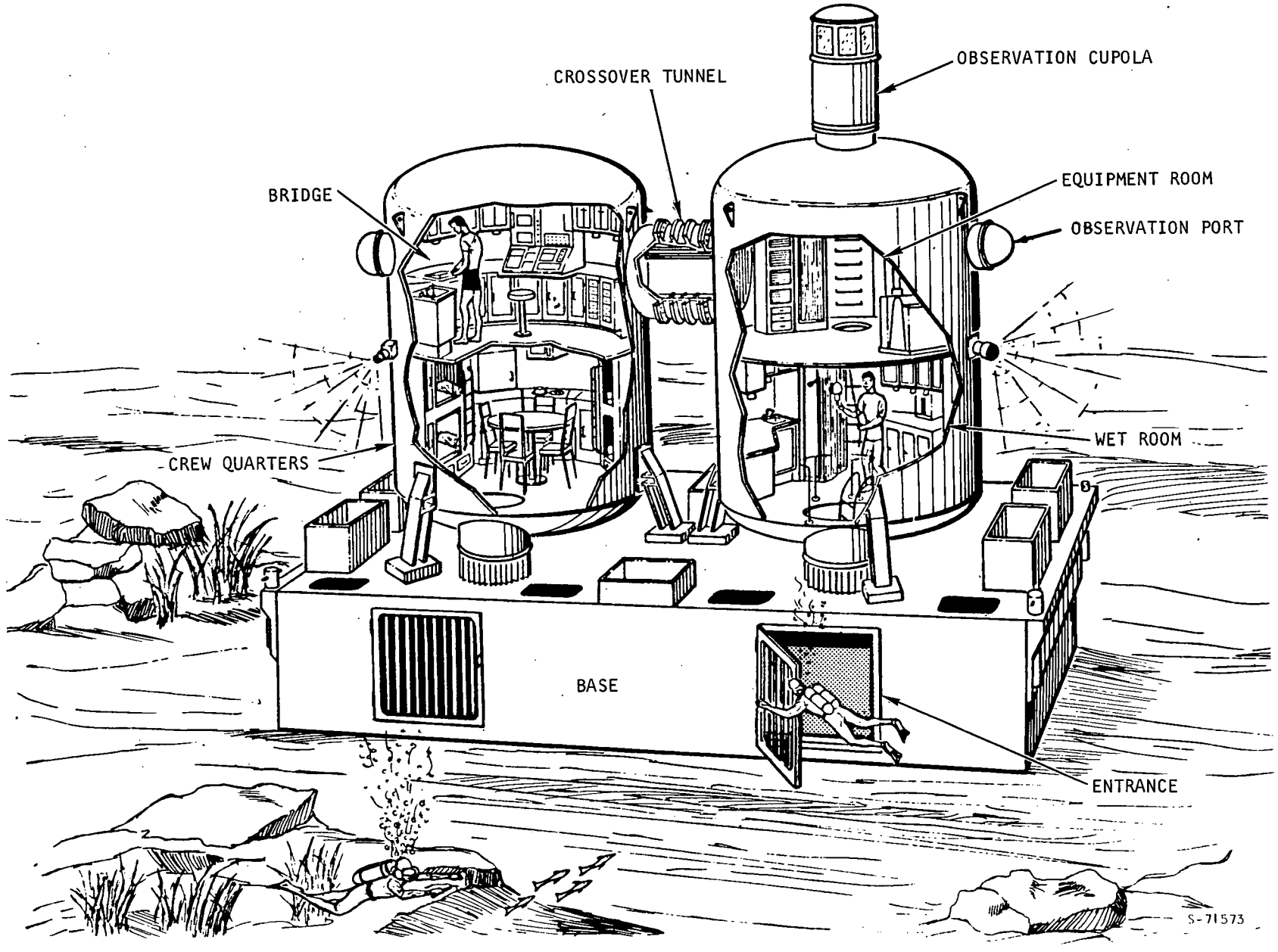


Figure 2-7. Tektite II Habitat Interior Arrangement

A scrubber removed CO_2 produced by the crew by chemical absorption with barium hydroxide. The system consisted of two blowers (one redundant), a barium hydroxide canister, and associated valves and piping. The blower forced circulation of the habitat air through the barium hydroxide, where CO_2 was absorbed. The processed air was then directed, in equal parts, to each of the four compartments.

The habitat was initially pressurized on the surface to the emplacement depth pressure with compressed air. Additional nitrogen was added following emplacement, thereby achieving an initial nominal oxygen partial pressure of 160 mm of mercury. During operations, compressed air was continually supplied via umbilical to the habitat. The habitat derived its electrical power from motor generator sources mounted on the shore.

The communications equipment aboard the habitat included a multistation intercom system, a sound powered phone, an intercom phone, open microphones, habitat-to-surface television, and an onboard video recorder/playback unit. The primary voice communication link with the surface was the intercom. There were stations in each compartment and in the cupola. A master station was located in the bridge directly below the television monitors. The sound powered telephone provided backup voice communication between the bridge and the watch director's console in the van on the surface. Each compartment in the habitat had a carbon microphone mounted in the ceiling. The microphones permitted monitoring of the compartments by behavioral scientists located on the surface.

Television cameras were located in each compartment; displays were provided on the bridge and in the control van. A commercial 1/2-in. helical scan video recorder and playback unit was located on the bridge. Output was displayed either in the crew quarters on the entertainment television monitor or on a bridge monitor. Tape output also was displayed at the behavioral monitoring station in the van. A two-way video communication link was maintained between the bridge and the command van.

A plumbing system from the surface to the habitat supplied potable water for drinking and washing. Hygiene provisions included a fresh-water shower; a freshwater wash-down hose in the wet room; sinks in the wet room, engine room, and crew quarters; and a clothes dryer in the wet room.

A standard marine-type toilet equipped with a macerator and decontamination supply was used. The toilet was flushed using sea water, and the sewage was pumped to a 900-ft distance from the habitat.

Habitat furnishings included bunks, refrigerator, stove, and personal hygiene provisions. Four bunks and personal gear storage provisions for the scientific crew were located in the crew quarters. A fifth bunk (fold-up) used by the habitat engineer was located on the bridge. A commercial refrigerator was provided for storage of bulk foods, and a stove, eating utensils, and dining facilities were located in the crew quarters.

The use of entertainment equipment formed a part of the habitability and behavioral experiment programs. Provisions included a commercial television, a television tape deck with a selection of programs, a NASA-supplied leisure equipment package containing a variety of leisure materials, and personal preference kits filled by each crewman.

A total of 10 scientific undersea missions (four 14-day missions and six 20-day missions) were performed during the course of the program. Each mission had a five-man crew consisting of four marine scientists and one engineer. Different crew members were used in each of the four 14-day missions. For the six 20-day missions different marine scientists were used in each mission, but each engineer remained in the habitat for 30 consecutive days (one and one-half missions). Thus, a total of 4 engineers were used for the six 20-day missions. There were a total of 48 aquanauts involved in the project, 40 of whom was scientists and 8 of whom were engineers. Aquanauts were selected, generally in teams of two, from a large number of applicants. A committee evaluated all proposals on their scientific merits and selected the most outstanding.

Unless the weather was very adverse, the daily routine of the aquanauts almost invariably included sorties into the nearby water in the bay for purposes of observation, collection, and measurement. These sorties were always done in groups of at least two aquanauts, and were followed from above by a safety support team in a boat. Watches on the habitat and its occupants' activities were kept 24-hr a day from the command van and from the dive platform. These watches were divided into 8-hr shifts, and were always supervised by a specially trained watch director in the command van. Supplies were delivered to the habitat by a surface support team from the support barge using large pressure pots. These were taken into the hatch in the wet room of the habitat, and left for the aquanauts. No visual or auditory contact was made between surface support teams and the aquanauts. Trash and garbage were removed by having the pressure pots sent out in the reverse direction.

The marine environment around the habitat was relatively stable. A daily light-dark cycle was present, but the sun itself was not visible. Visibility of the water varied with weather, time-of-day, and the season, but was generally better than 35 ft. Marked diurnal variations were present in the fauna near the habitat.

All missions were carried out following closely to schedule. One tropical storm came near enough to the island to slightly alter the decompression routine of one mission. Another storm made surface traffic so difficult that the aquanauts were left without supplies for a few days. However, in general, no difficulties with equipment or weather were so severe as to seriously alter operating plans.

SECTION 3

BACKGROUND AND ORIENTATION: EMPIRICAL STUDY OF HABITABILITY

There have been a number of excellent and thoughtful attempts to develop the aspect of scientific psychology which deals with the relation of man to specified nonlaboratory environments. Reviews of earlier work on this problem are available in Fiske (ref. 1) and Barker (ref. 2), and more contemporary reviews are to be found in Craik (ref. 3) and Righter, Nowlis, Dunn, Belton, and Wortz (ref. 4).

In spite of these attempts, the empirical investigation of the relationship between man and his everyday environment is still at a very primitive level. René Dubos (ref. 5), for example, warns that "awareness of the fact that surroundings exert a profound effect on human life is based largely on untutored observations and has not yet been converted into scientific knowledge.

As Craik (ref. 3) points out, there has been an increasing need for psychology to develop criteria relevant to human response to the physical environment. Craik reviews approximately 400 references relevant to the problem. He states, "the intellectual disciplines and professions committed to understanding and designing the physical environment acknowledge a common need for a behavioral orientation to their endeavors. Whether scientific psychology can contribute to this particularly urgent enterprise remains to be demonstrated."

Progress in understanding the relationship between felt quality of life and variations in selected parameters of man's environment offers the promise of immediate and meaningful application to many problems of environmental design, as well as the possibility of better understanding theoretical extrapolation to nonlaboratory situations. These possibilities have attracted many psychologists to do research in this area.

Many difficulties have been experienced, however, in attempts to scientifically study man-environment relations. One of these difficulties has been a lack of willingness on the part of psychologists to recognize the full complexity of the man-environment problem. In this respect the studies of the geographer Gilbert White and his colleagues (ref. 6) are relevant in that they find a very strong human tendency to oversimplify the nature of the environment. Thus, people living in areas susceptible to natural hazards such as floods, earthquakes, fires, etc. tend to adopt clear explanations for such events (e.g. the floods come once every five years) at the expense of recognizing the actual uncertainty and unpredictability involved. It seems that psychologists are as prone to this problem as other humans. (In fact, such oversimplifying tendencies have caused important problems in many fields or science, ref. 7). There have been essentially no studies

of the relation between man and his physical environment which have included more than one level of observation, and very few studies which have included a comprehensive clarifying of relevant variables even at one level of observation. Furthermore, theory has rarely been allowed to evolve from observation of men in the actual environments under study; rather it has been transferred from laboratory or clinic without appropriate modification.

Thus, in spite of the many studies done, psychology is totally lacking in a systematic and comprehensive model of man and environment interaction in non-laboratory and nonclinical situations. In fact restaurant owners, artists, wives, salesman, hosts, and other lay people often show more sophistication in assessing and correctly predicting the psychological effects of certain kinds of environments than can be shown by the trained psychologist.

However, the lay person is limited in two respects: First, his knowledge of the effects of environment is usually limited to just a few specific environments and often to the effects of that environment only on certain people. Second, the lay person's observations are not usually in quantified form. The program delineated in this report is oriented toward further development of a broad-base understanding of habitability and toward making the problem more amenable to empirical analysis. These tasks of delineation and measurement hopefully will lead to making the problem of habitability more susceptible to scientific inquiry.

According to Webster (ref. 8), habitable means "fit to live in." The psychological process involved has been tentatively defined by this research group as perception of quality of life in a specific environment. More specifically applicable to this report, habitability is a function of the interaction of (1) the patterns of requirements for mission fulfillment, life support, and psychological maintenance; and (2) the physical-temporal characteristics of the space involved.

The three main approaches available for empirical study of habitability are (1) measuring ongoing responses (via self-report of subjective events, observation of overt behavior, and physiological recording) during residence in the habitat; (2) gathering background data on each person undergoing residence in the habitat; and (3) measuring habitability by evaluation of mission objectives, the physical properties of the habitat itself, and the interaction between the two.

Measurement of these aspects of habitability can lead to:

(1) Development of descriptive frameworks for adjustment to a given habitat over time.

(2) Better understanding of the antecedents of individual variations in adjustment to a habitat.

(3) Identification of key physical design factors and mission objectives structures that independently, and in interaction, affect habitability.

Such information can be used to improve planning and design for particular physical habitats, to improve personal adjustment to a habitat, or to improve the selection process for choosing people to undergo prolonged stays in the habitat.

BACKGROUND

Research that has been done in the field of habitability gives considerable support to the theory that one's surroundings exert a strong influence over one's behavior.

Maslow and Mintz (ref. 9), for example, showed that the aesthetic quality of a room has a strong effect on subject's tendencies to preceive well-being and energy in a standard series of photographs of people's faces. Compared to perceptions reported in an average room, an aesthetically beautiful room led to increased perception of well-being and energy, and an ugly room led to decreased perception of these same qualities.

Zinner (ref. 10) studied the probabilities of various observable behaviors in various environmental situations. He found that situations he studied exerted a powerful force on observable behavior. He then concluded, "These results imply that once one has ascertained the probability that various situations will evoke or suppress behaviors considered desirable or undesirable, one may increase probable occurrence of desirable behaviors by modifying the environment." This statement is based meaningfully on empirical data and provides justification for the importance of habitability research on man-made environments.

Similarly, Moos (ref. 11), Moos and Houts (ref. 12), and Fairweather, et al. (ref. 13) have gathered a considerable amount of evidence to indicate that the atmosphere (a concept closely related to habitability) of mental hospitals has considerable effect on behavioral tendencies of residents, and futhermore, it is related to cure rate. Conversely, studies in psychiatric epidemiology such as those reviewed by Kramer (ref. 14) have helped to establish a link between habitat and mental illness. A particularly good example in this respect is that of Wilner, Walkely, Pinkerton, and Tayback (ref. 15), who studied two matched samples--one provided with good housing and the other with poor housing.

Calhoun (ref. 16), furthermore, has shown that crowding in habitats can produce marked changes in animal behaviors. Rats in high population density areas show extremely high infant mortality rates and much higher rates of disturbed eating and sexual and maternal activities than rats in normal population density habitats.

Thus, there is evidence that habitat can have a significant effect on behavioral tendencies. In fact, some researchers, such as Gump, Schoggen, and Redl (ref. 17), Rausch, Farbman, and Uewellyn (ref. 18), and Stern (ref. 19), suggest that surroundings exert at least as much influence on emitted human behavior as does personality.

There are a number of reasons to feel that empirical study of man's response to isolated habitats may be particularly useful in making further progress in understanding the psychology of reactions to environments. Isolated habitats are not quite as rich and changeable as natural living habitats, and people residing in them stay there for long periods of time under relatively unvarying conditions. Thus, the overwhelming complexity of the natural environment, which has been the downfall of so many psychological research projects, is minimized to some extent, but similarly, the oversimplification of the laboratory situation is avoided. Reviews of the studies of isolated habitats (refs. 20 and 21) are encouraging in that some consensus of results may be emerging. Such findings will be presented in more detail in Section 5.

ORIENTATION

Many measurement techniques should be and are currently being tried in the study of isolated environments. However, no multilevel assessment procedures have been developed as yet in psychology for the problem of habitability. Thus, complete description of the effects of a habitat on overt and covert behavior has not been achieved, and identification of critical parameters in the problem only has been tentative.

In this report, a battery of assessment techniques has been formulated that is amenable to the general constraints for selection of the habitability measures listed below:

(1) Measures should be as simple as possible.

(2) Measures should have theoretical relevance to the construct habitability.

(3) A wide domain of habitability levels should be examined, including physiological, subjective, and overt behavioral responses to the environment in question.

(4) Measures should be as nonintrusive and nondisruptive to the subjects as possible.

(5) Hypotheses for each measure should concern (1) its temporal variation, (2) its overall covariation with other measures selected in the study, (3) its responsiveness to recordable changes in the ongoing situation, and (4) its variation in individuals in the situation.

(6) A plan for empiricizing and analyzing each measure should be made in advance.

(7) Research must not interfere with overriding operational requirements for mission success and safety.

(8) Where possible, heterogeneous methods of observation should be used in making measurements at any one particular level of habitability.

(9) When possible, measures chosen should already have demonstrated-reliability, validity, and usefulness in earlier studies.

The reasons behind most of these constraints should be easily inferrable; generally, in measuring aspects of habitability, experimental intrusions were minimized. Where feasible, the relationship of the data to models of habitability and hypotheses generated from these models has been developed, while attempting to maintain a mixture between theorizing and openness to fresh information. Extant tests were used in the battery when possible, in part because test construction and development is a particularly slow and expensive process and in part to maximize the ability to generalize the findings. The constraints in some cases had to be balanced against each other, and were satisfied to varying degrees in the actual research operation, as shown in the following sections.

SECTION 4

METHODS AND PROCEDURES

The instruments employed in this program were

(1) The habitability assessment rating scale (HARS)

(2) The Tektite environmental assessment (TEA)

(3) The mood adjective check list (MACL)

(4) The 16 personality factor questionnaire (16 PF)

(5) Content analysis of postdive debriefing interviews

(6) Leisure time observations.

In addition, behavioral observations, done as an independent study by Dr. Robert Helmreich and associates from the University of Texas (ref. 22), were used, adding a new level to the habitability data collected with the other instruments described above.

The HARS, TEA, and debriefing forms and content analysis categories were measuring devices specially designed for this research project. However, these instruments were designed to be used in evaluation of any habitat. Physiological measurements were impossible because collecting them would have been too expensive and difficult in the remote tropical situation.

The habitability assessment rating scale (HARS) was an attitude scale used by the 48 aquanauts to rate 62 specific items in the habitat for performance of function, comfort in use, convenience of location, ease of maintenance, aesthetic value, and safety. This instrument was filled out in the habitat by all aquanauts five days before completion of each mission. A copy of the HARS form is shown in Appendix A.

The Tektite environmental assessment (TEA) form is another type of attitudinal form that was filled out by the aquanauts (while still in the habitat) four days before the end of each mission. This instrument specifically was used to evaluate various general features of the habitat environment as these features affect various activities performed by the aquanauts. It can be viewed as an activities-by-support matrix, and provides information of a more general nature than the HARS. A copy of the form is shown is Appendix B.

The mood adjective check list (MACL) was used to investigate feelings dominant in the habitat, and how tendencies toward these feelings interrelated with the other data collected. Aquanauts were asked to self-administer the form daily. A 1-min version of the test successfully used in an earlier study (ref. 23) was employed. Eleven factors are included in this version of the MACL; the same three words are always used as the basis for obtaining

a score for any one factor. (There are 33 words altogether.) The order of presentation was randomly varied in six different forms of the checklist so as to offset memorization of the list and habitual checking response tendencies. These six copies of the MACL are shown in Appendix C, together with some background information on the test.

Prior to the beginning of each mission, all aquanauts completed the 16 personality factor questionnaire (ref. 24). The 16 PF test has been shown to be of particular value in predicting adjustment to real-life situations (refs. 25 and 26). The version of the 16 PF used in this research is contained in Appendix D.

Immediately after mission completion and prior to exposure to the press, each aquanaut was individually administered a standardized and private debriefing. These tape-recorded interviews were subsequently content-analyzed by independent raters who demonstrated high interjudge agreement. The questions used in the debriefing of all aquanauts are presented in Appendix E. The content analysis system used in scoring the interviews also is presented in Appendix E.

Leisure time observations were made using two methods. First, all aquanauts were asked in their debriefing interview about leisure preferences in the habitat. Also, on one mission a detailed topside observational record of leisure time activities was maintained. This observational system is described in more detail in the section on leisure behavior. (The study purposely provided the habitat with a wide range of leisure materials to be used by the aquanauts at will so that observations could include amount of time spent in these various leisure activities and aquanauts could be asked about their favorite leisure pursuits during the debriefing interviews.)

Thus, although the physiological level of adjustment to the habitat could not be examined, it still was possible to obtain and correlate indexes related to both the level of overt behavioral adjustment to the habitat and the level of subjective response. The objective response data were those made available to us through the cooperation of Dr. Helmreich and his colleagues, along with observations made during our study on overt leisure activities. The subjective response level as monitored included several attitudinal measures, a mood measure, a personality measure, and content analysis of response to a wide ranging debriefing interview. Although many indexes of habitat adjustment were neglected, it still was feasible to conduct a relatively comprehensive investigation into the problem of perceived quality of life in an isolated habitat even under the limitations imposed by the tropical environment and the demands of an ongoing high-level marine sciences program.

SECTION 5

RESULTS

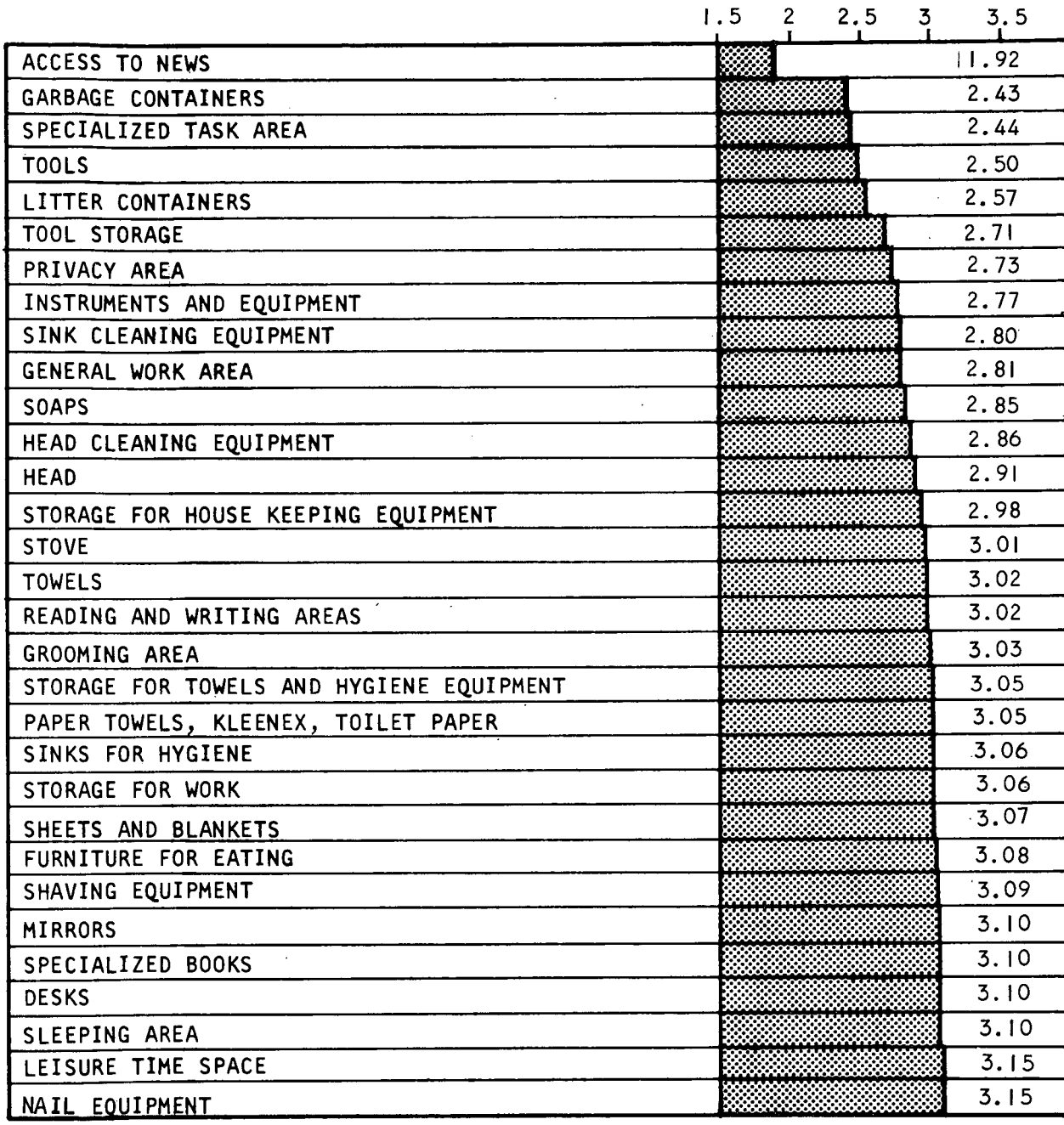
DURING-MISSION ATTITUDES TOWARD THE HABITAT

The results of aquanaut evaluation of the habitat using the HARS form revealed that the most positively rated items were added touches of luxury such as the air-conditioning, carpeting, and the shower. Also highly regarded were various items for recreation. The most poorly rated items included those intended to provide support for scientific and engineering tasks and the provision of information. The most disliked characteristic of the habitat, rated as lower than poor, was access to news. Clearly the aquanauts would have liked to have been better informed on current events; their radio picked up few English-speaking stations, and newspapers and magazines were rare and generally out-of-date. Thirteen additional items were rated as poorer than ordinary, including specialized and general working areas, tool and tool storage, areas for private reflection, garbage and litter containers, cleaning equipment for sinks and the head, instruments and equipment for program tasks, soaps, the head, and storage areas for housekeeping equipment. Numerous written comments were made by the aquanauts on the forms to clarify the problems involved. For example, the head leaked, spit water back when flushed, and was poorly ventilated; tools were not carefully matched to the sizes and requirements of what was in the habitat; and working areas were designed so that too many activities occurred in them, making it difficult for several aquanauts to do in-habitat research at the same time. Also, the areas for private reflection (the cupola and the bunks) were considered too small and were not private enough. Fig. 5-1 shows the ratings for each of the 62 items.

The composite results of the TEA are listed in Table 5-1. Each of the 138 TEA cells, and also its 12 rows and 13 columns are shown. Of the 12 rows describing different types of environmental support in the habitat, temperature and humidity score quite high; this agrees with the high rating on the HARS of the environmental control system. The two most significant problem areas are (1) lack of noise control in the habitat and (2) lack of variety. From this measure it also is clear that the most unsupported aquanaut activity (shown by columns) was in-habitat science.

Looking at the problems more specifically, the particularly low scoring cells in the TEA (rated below fair) include amount of room for in-habitat science experiments, physical layout for in-habitat science experiments, and location of in-habitat science experiments.

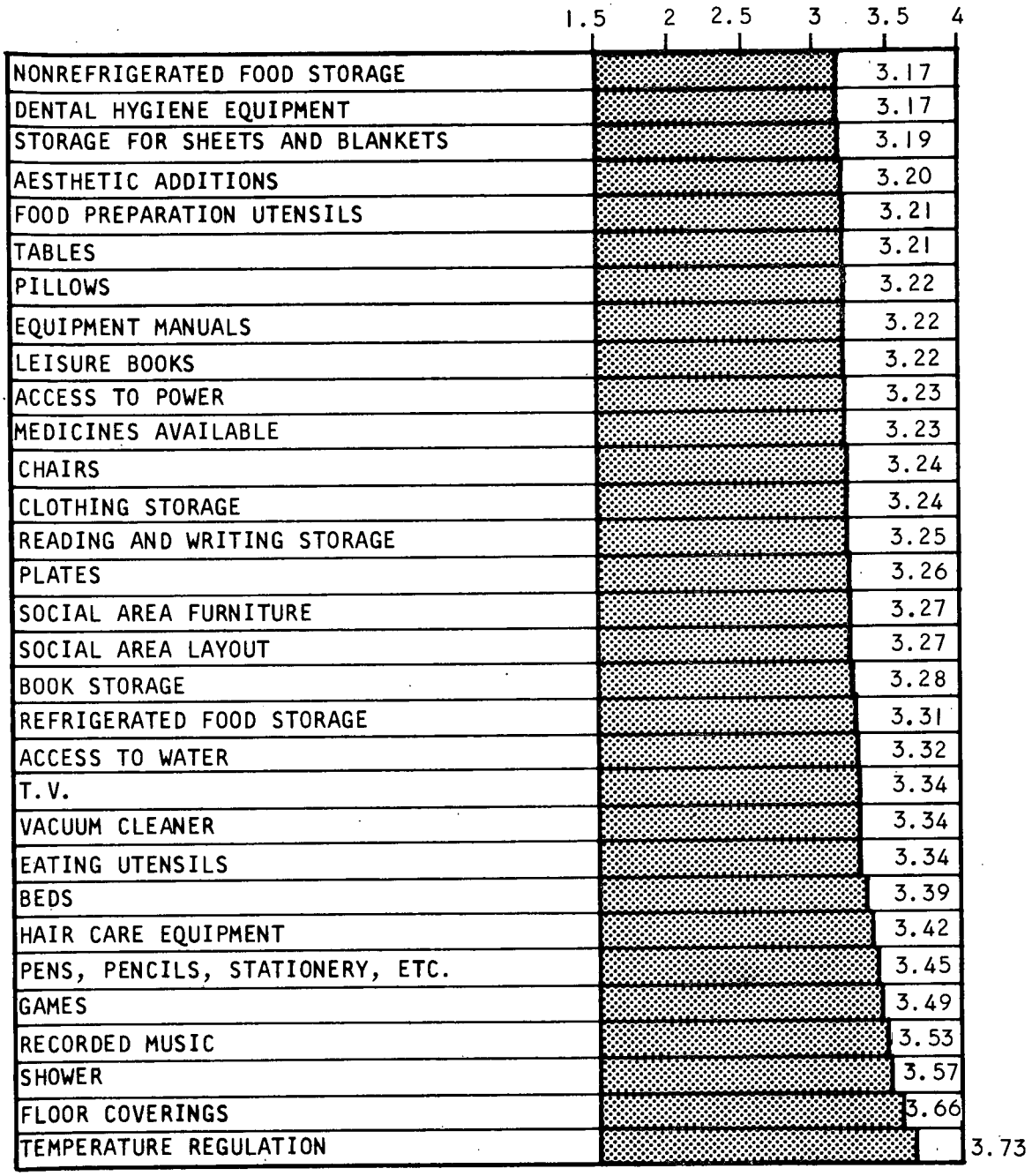
Another set of low-scoring cells, rated just above fair, include the layout of the habitat and the amount of room in the habitat for inside maintemance. Thus, the engineer's tasks, which largely consisted of maintenance, were almost as difficult in the habitat as were the scientists' tasks.



SCORING SYSTEM:
5 = SUPERLATIVE
4 = VERY GOOD
3 = ORDINARY
2 = POOR
1 = VERY POOR

S-71598

Figure 5-1. Habitability Assessment Rating Scale Means (N = 43)



SCORING SYSTEM:

5 = SUPERLATIVE
4 = VERY GOOD
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2 = POOR
1 = VERY POOR

S-71599

Figure 5-1. (Continued)

TABLE 5-1

MEAN ENVIRONMENTAL ASSESSMENT SCORES (N = 41)

Assessment	Sleep	Food		Recreation		Social interaction	Work				Hygiene		Overall	Average
		Eating	Preparation	Exercise and active recreation	Games, books, entertainment		Science inside	Maintenance inside	Access to outside	Work outside	Waste elimination	Washing, showering		
Is there enough room?	3.12	2.76	2.46	2.32	2.83	2.80	1.69	2.15	2.51	X	2.61	3.12	2.98	2.62
Is the lighting of the area satisfactory?	3.27	3.41	3.20	3.26	3.34	3.16	2.72	3.08	3.08	2.77	3.30	3.32	3.18	3.16
Is the location of the area satisfactory?	3.12	2.98	2.90	2.67	2.89	3.00	1.95	2.31	2.71	3.06	2.79	3.18	X	2.82
Is the layout of the area satisfactory?	3.03	2.78	2.63	2.50	2.77	2.89	1.86	2.07	2.49	X	2.81	2.97	2.87	2.66
Is it quiet enough?	2.22	2.59	2.63	2.38	2.37	2.38	2.20	2.34	2.24	X	2.47	2.62	2.31	2.40
Is there a lack of odor?	3.15	3.00	2.83	3.18	3.19	3.11	2.73	3.14	2.68	X	2.38	2.83	2.90	2.92
Is the temperature satisfactory?	3.48	3.59	3.35	3.37	3.45	3.63	3.37	3.45	3.34	3.56	3.57	3.63	3.59	3.49
Is the humidity satisfactory?	3.60	3.66	3.62	3.47	3.57	3.66	3.51	3.61	3.47	X	3.61	3.62	3.68	3.59
Is enough time allowed?	2.80	3.32	3.24	2.86	2.86	3.25	2.88	2.64	3.19	3.26	3.21	3.38	X	3.07
Are the times available OK?	3.36	3.24	3.24	3.21	3.00	3.06	3.21	2.84	3.57	3.60	3.37	3.42	X	3.26
Is there good selection and variety?	X	2.75	X	2.30	2.67	X	2.48	X	X	X	X	X	X	2.58
How does the habitat affect the activity in general	3.16	3.10	2.79	2.47	2.75	2.97	2.32	2.55	3.20	3.46	2.66	3.27	X	2.90
Average	3.12	3.08	2.95	2.82	2.98	3.07	2.54	2.74	2.91	3.26	2.94	3.18	3.07	2.96

Key: 1 = Poor, 2 = Fair, 3 = Very good, 4 = Excellent, X = Not applicable

Another problem evident from the TEA results is amount of noise as it affected sleep. From the interviews, which will be discussed subsequently and from notes written in the appropriate space on the TEA, this problem was associated particularly with the intercom; an aquanaut could not communicate over the intercom, either to other areas of the habitat or to topside, without the transmissions being heard in the crew quarters where other aquanauts might be sleeping. Also evident on the TEA are problems associated with insufficient room for active recreation and exercise, insufficient variety of exercise and active recreation, odor problems in the hygiene area, lack of room for food preparation, and poor layout of the access way to outside work. All of these problems also are apparent in the interview results. It is surprising that aquanauts had as many complaints as they did about insufficient active recreation and exercise because they were spending a good proportion of their waking hours in the water. Zubek (ref. 27) has presented data to indicate that exercise is useful in combating the effects of sensory restriction. Thus, the felt need for exercise may be higher in an isolated situation like Tektite. It also could be that the aquanauts had simply developed strong habits for keeping in good physical shape, and found no good area in the habitat to maintain their regular exercise schedules.

It is important to observe that both the HARS and the TEA are geared only toward the perceived intrinsic value of various items, and not toward their perceived utility or instrumentality. (For further discussion of these two important and relatively independent components of attitude, see ref. 28.) Other instruments must be used to tell the actual utility of each item; the value component of attitude can only give a limited picture of habitability. For example, the results of the HARS show that the games in the habitat were well regarded in and of themselves. However, as shown subsequently, this does not necessarily mean that the games were much used, or were considered important in establishing an overall feeling of habitability.

POSTDIVE INTERVIEWS

Aspects and items listed on the TEA and HARS forms also were discussed in the postdive interviews, not only for evaluations in and of themselves, but also as a guide to the relative importance or utility of such things to the aquanauts in determining quality of life in the habitat. The interviews were examined in several ways, and part of the interview data are presented subsequently in the leisure time discussion. In this discussion, aquanaut complaints presented during interviews are examined. Complaint was broadly defined to include any criticism or problem that the aquanaut reported with respect to his stay in the habitat. A total of 859 such complaints were counted in the interviews, which is an average of 17.9 per aquanaut. These are classified under six broad headings and a number of smaller headings in fig. 5-2. The greatest number of complaints centered around the general area of habitat design. Specifically, the aquanauts were unhappy with the design of the habitat affecting task support. A somewhat different picture appears in the interview data than the HARS and TEA data because the aquanauts could highlight their criticisms more freely in the interview. Although the access to news was condemned on the HARS, this issue was not nearly as much on the aquanauts' minds in their interviews as was the general issue of task support.

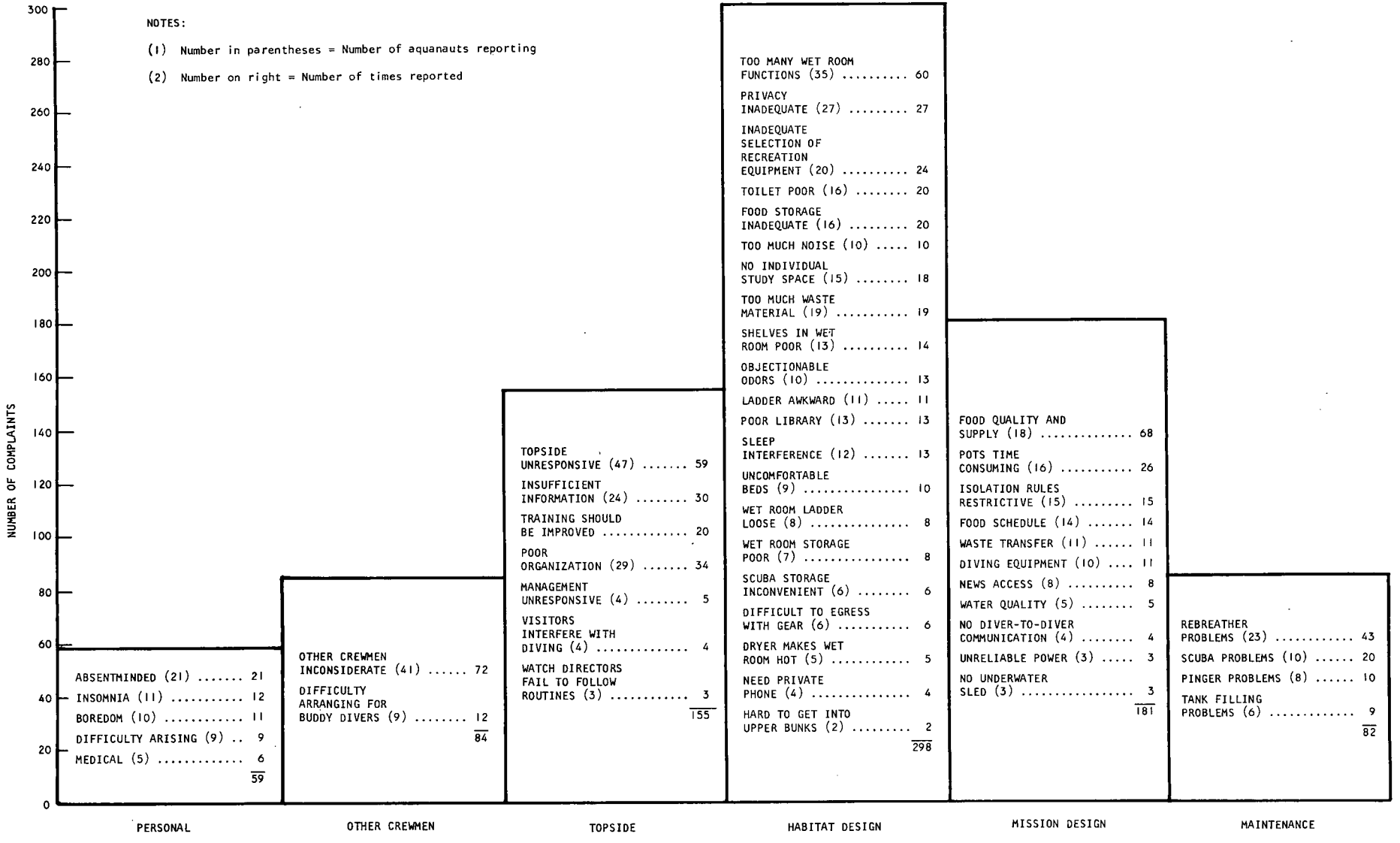

Figure 5-2. Number of Complaints (From Debriefing Tapes)

The emphasis of task-relevant problem areas is reminiscent of other studies made of scientists in isolated situations. Where professionals are doing actual research, the key to these men in their evaluation of the isolated environment is as it relates to professional motivations in living there. (See ref. 29 through 31.)

The complaints also show the importance of food. Designers of isolated habitats such as submarines, who put a good deal of emphasis on food, would appear to have support from these interviews. However, there is an additional factor to consider (fig. 5-3). Three missions were given self-selection over their food; as much as possible their requests for food were carried out through the closest supermarket, some hours away on Saint Thomas Island. The other seven missions were given a preprogrammed selection of foods of good nutrition and quality, largely in frozen TV dinner type containers. In spite of the expense and care that went into these latter food menus, 39 of the total of 40 debriefing complaints made about food quality occurred in the missions with the preprogrammed frozen foods. This can be attributed primarily to the factor of self-selection.* Our own observations would rate the frozen food higher in quality, both tastewise and nutritionally, than the meals the aquanauts chose for themselves. It is believed that totally independent judges would make similar ratings. Finally, 16 of the 20 complaints about food storage were from aquanauts in the preprogrammed food contingency, and 15 of 19 complaints about too much waste were from this same group. Thus it appears that the preprogrammed food not only ignored individual choices, but also was overpackaged for a small habitat.

DURING-MISSION MOODS

Although somewhat surprising, it appears that aquanauts felt very little anxiety during their stay in the habitat and very little depression as well. (See Table 5-2). Positive moods, including concentration, activation, social affection, pleasantness, and nonchalance, are strongly predominant.**

This finding is given further support from study of the interview tapes. Aquanauts explicitly and spontaneously stressed in a number of these interviews that they themselves were surprised at how little anxiety they felt during their mission. However, there was definitely some variation in the tendency to have or not have such feelings. Therefore, the relationships between tendency towards these moods, the attitudinal data already discussed, and some of the behavioral measures collected by Dr. Robert Helmreich and his associates from the University of Texas were compared. Since scientists and engineers had quite different kinds of tasks to perform in the habitat, and thus the adjustment process to living under the sea was different for these two groups, correlations were obtained for scientists only between (1) selected

*The importance of self-selection in creation of positive attitudes has been given strong empirical support in recent studies by Zimbardo (ref. 32).

**Note that this predominance of positive affect is much less apparent as mission duration increases. Data pertinent to this problem are presented in a subsequent section.

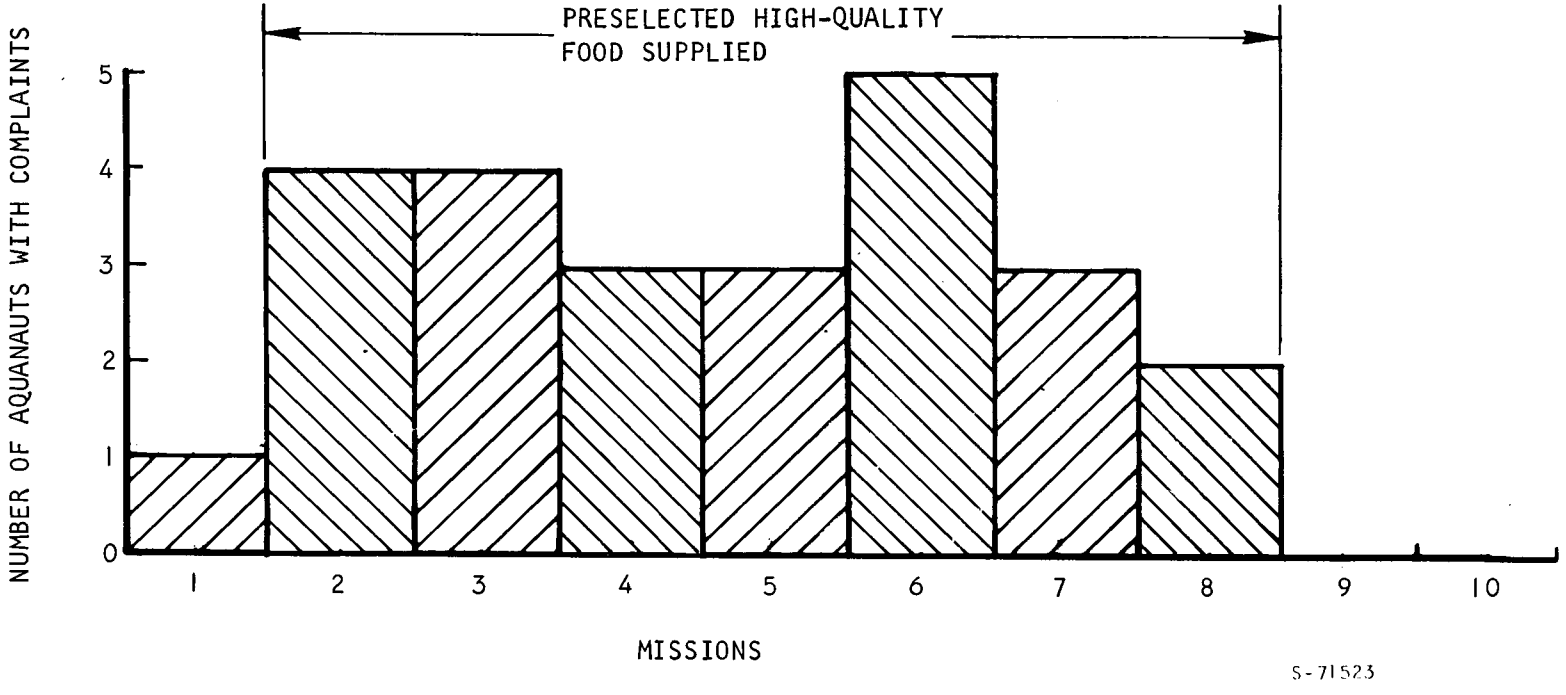

Figure 5-3. Food Quality by Mission

TABLE 5-2

MEAN SCORES ON THE MOOD ADJECTIVE CHECK LIST
(SELF-ADMINISTERED DAILY IN THE HABITAT)

	Mean Score*		Mean Score
Concentration	3.81	Deactivation	1.81
Activation	3.81	Aggression	0.51
Social affection	2.80	Egotism	0.51
Pleasantness	2.78	Skepticism	0.44
Nonchalance	2.10	Depression	0.33
		Anxiety	0.25

*The lower the score, the less common was the feeling in day-to-day life in the habitat.

mood variables and (2) attitudes and behaviors displayed in the HARS, interview, and course of living in the habitat. In particular, correlates of pleasantness, depression, and anxiety in daily life in the habitat were determined.

Those who felt more pleasant emotions while living in the habitat tended to rate the habitat more favorably on the HARS (r = 0.43); also, they tended to do relatively more total work (r = 0.35) and have less total leisure (r = 0.33) as indicated in Table 5-3.

On the other hand, those with a tendency to feel depressed while living in the habitat spent more time in solitary recreation (r = 0.38) and in idling (r = 0.32), are rated independently as less stable and less enthusiastic by interviewers (r = 0.39 and 0.39), and in the interviews reported sleeping less well in the habitat (r = 0.37), tended to state there was not enough privacy in the habitat (r = 0.35), were generally less positive about the habitat (r = 0.35), had more complaints (r = 0.34), and had a more negative attitude toward topside (r = 0.31). Similarly, those who felt more anxious while in the habitat were scored by interview raters as less stable (r = 0.49) and less enthusiastic (r = 0.41), and showed on the interview less positivity toward the habitat (r = 0.47), less positive attitudes toward topside (r = 0.45), and had more complaints (r = 0.32). On an independent scale asking aquanauts to rate the amount of visual, auditory, and tactile variety in the habitat, those tending toward depression and anxiety rated the habitat as having less variety (r = 0.36 and 0.37, respectively). All the above correlations are statistically significant. It appears from these results that one's moods or morale in an isolated habitat are highly interrelated with one'e attitudes toward the habitat and topside support, and with one's actual work and leisure tendencies while in the habitat.

TABLE 5-3

SOME RELEVANT CORRELATIONS BETWEEN MOOD AND OTHER VARIABLES

	r
Positive habitat rating/pleasant emotions	0.43
Total work/pleasant emotions	0.35
Less total leisure/pleasant emotions	0.33
Rated less stable/depressed	0.39
Rated less enthusiastic/depressed	0.39
Solitary recreation/depressed	0.38
Sleep poorly/depressed	0.37
Poor variety in habitat/depressed	0.36
Felt privacy inadequate/depressed	0.35
Number of complaints/depressed	0.34
Idling/depressed	0.32
Less positive habitat rating/anxious	0.47
Less positive attitude to topside/anxious	0.45
Less enthusiastic/anxious	0.41
Poor variety in habitat/anxious	0.37

Thus on the behavioral level, those showing more isolated and non-work-oriented behavior tend also to show on the subjective level more negative daily moods. This tendency for poor morale and poor involvement with work and with others of the group is in concordance with impressionistic studies of isolated habitats by Pope and Rogers (ref. 31) and Nelson (ref. 30). Similarly, on the attitudinal level, more negative attitudes toward the habitat go with more depressed and anxious moods. It is still not clear if there is causality in these relationships. The data simply indicate that behavior showing lack of either work or social involvement and attitudes showing poor perceived quality of life in the isolated habitat are intimately linked with less pleasant and more negative moods.

PERSONALITY DATA

Percentile scores are shown separately for the scientists and engineers in Table 5-4. With respect to the general population, the scientists are unusually reserved, intelligent, emotionally stable, and imaginative. The engineers are unusually intelligent.

Male and female aquanauts had very similar scores on all factors except conscientiousness, where the females were rated as somewhat more conscientious than the males. Aquanauts in shorter and longer missions also had quite similar scores.

A good number of significant relationships were found between personality scores on the 16 PF and mood responses on the daily mood check list, but these correlations are not of sufficient strength to be used as a basis of crew selection and are not of major theoretical import. With respect to correlations between 16 PF factors and behavioral observations made by Dr. Helmreich and his associates, two personality factors found to be especially predictive of habitat adjustment are intelligence and suspiciousness. Intelligence correlates with direct marine science (r = 0.57), total leisure (r = 0.53), solitary recreation (r = -0.52), total marine science (r = 0.51), total work (r = 0.48), total in-water diving (r = 0.39), marine science support (r = 0.36), idling (r = -0.36), and sleeping (r = -0.32). Suspiciousness correlates with direct marine science (r = -0.42), total in-water diving (r = -0.40), total leisure (r = 0.39), and solitary recreation (r = 0.34). It appears that intelligence is highly predictive of behavioral work adjustment in the habitat. More intelligent aquanauts find more work to do. Suspiciousness, however, is predictive of negative work adjustment. Suspicious, less-open aquanauts show less observable work involvement.

DURATION OF MISSION AND ITS EFFECTS ON SELECTED VARIABLES

Do people's reactions to an isolated habitat vary according to the length of time they live in it? The design of the Tektite mission program provided a good opportunity to investigate this question, particularly having established that there were no orderly relationships between mission duration and personality of the aquanauts.

TABLE 5-4

MEANS FOR SCIENTISTS AND ENGINEERS ON THE CATTELL 16 PF TEST

16 PF factor	Percentile all engineers	Percentile all scientists
Outgoing	lower 15%	lower 9%
Intelligent	upper 9%	upper 9%
Emot. stable	upper 15%	upper 9%
Assertive	upper 75%	average
Happy-go-lucky	average	average
Conscientious	average	average
Venturesome	upper 15%	average
Tender-minded	average	upper 15%
Suspicious	average	lower 15%
Imaginative	upper 15%	upper 9%
Shrewd	average	average
Apprehensive	lower 15%	lower 15%
Experimenting	upper 15%	upper 15%
Self-sufficient	average	average
Controlled	upper 15%	upper 15%
Tense	average	lower 15%

Four missions, including 16 scientists and 4 engineers, were allowed only two weeks in the habitat. These missions were at the beginning, middle, and end of the program. Six missions, interspersed between the shorter missions, involved longer durations of habitation. Members of these missions stayed either 20 or 30 days.

A limited number of key variables thought particularly informative as to perceived life quality in a mission were selected. Of most interest were orderly effects on variables between those aquanauts staying 14, 20, and 30 days (that is, whether or not any of the variables would show an increase or a decrease with increase in mission length.

The results are shown in Table 5-5. Many variables do show orderly mission duration effects. The overall means from the HARS and TEA and the overall positivity score from the interview clearly decreased as mission length increased, as did attitudes toward recreational possibilities on the HARS and TEA. Also of interest is that aquanauts thought less of the habitat as it was supportive to their research (if scientists) or engineering tasks (if engineers) as mission duration increased. But this decrease in positive attitudes clearly did not apply to attitudes toward topside. On the latter key variable, positive feeling increased as mission duration increased.

With respect to moods, it is clear that positive moods of social affection, pleasantness, activation, and concentration tended to decline dramatically with increase in mission duration. Interpretation of this finding is not as simple as it would first appear, however, in that a slight but orderly decrease in negative feelings as mission duration increased was also present. This suggests that along with the dramatic decline in positive feeling, there was a tendency for these moods to be replaced by a state of flat and steady unemotionality. Apparently longer missions encourage aquanauts to be in a routinized, neutral mood where things occur fairly automatically so there is less activation, less concentration, and less intensity of feeling either in a positive or negative sense. Of the mood data, positive moods all showed a similar declining slope except for social affection. The latter variable showed easily the steepest negative slope for both scientists and engineers. The negative moods of anxiety and depression did not show as steep a decline as the positive moods.

In the category of behavioral variables there was a noticeable decrease in the percent time of total work with longer duration missions, and a similar strong tendency for percentage of time in sleep to increase. Total percent time in leisure, however, stayed at a rather steady level throughout. The scientists showed more of a change in percent time at work and percent time in sleep than did the engineers.

Work support, overall positivity, and HARS recreation support show the strongest uniform downward trends of the attitudinal data analyzed.

TABLE 5-5

EFFECTS OF MISSION DURATION ON SELECTED ATTITUDINAL, MOOD, AND BEHAVIORAL VARIABLES

Behavioral variable	14-day scientists (N = 16)	14-day engineers (N = 24)	20-day scientists (N = 4)	30-day engineers (N = 4)
Attitudes*				
HARS recreational and leisure time support items	3.51	3.62	3.28	3.20
HARS overall mean rating	3.35	3.31	3.10	3.00
TEA recreation environment and facilities	2.87	3.23	2.84	2.82
TEA overall mean rating	2.98	3.20	2.95	2.88
Was your habitat supportive of your work (interview)	2.56	2.75	2.29	1.75
Attitude toward topside (interview)	2.31	2.25	2.50	2.75
Overall positivity score toward habitat (interview)	12.94	13.50	12.79	11.75
Moods**				
Pleasantness	3.12	4.08	2.43	2.23
Anxiety	0.38	0.29	0.20	0.05
Depression	0.51	0.37	0.25	0.00
Social affection	3.62	4.64	2.15	1.56
Concentration	4.30	5.10	3.28	3.74
Activation	4.00	4.81	3.55	3.54
Behavior***				
Total work	37.24%	32.55%	31.96%	30.59%
Total leisure	19.67%	24.48%	19.10%	24.99%
Total sleep	32.64%	31.75%	37.37%	32.49%

*The higher the number, the more positive the attitude
**The higher the number, the more prevalent the mood
***Supplied by Dr. Robert Helmreich. (NOTE: These percentage figures made available to use through the generous cooperation of Dr. Helmreich do not total to 100 percent because of some additional minor categories used by his observers.)

LEISURE TIME NEEDS, PREFERENCES AND ACTIVITIES DURING THE STAY IN THE HABITAT

Leisure time only can be arbitrarily defined, and this was especially true with respect to leisure time in the Tektite II habitat. The term leisure time is not always on the mark, particularly for well-adjusted and adventurous individuals doing the kind of work they most enjoy. Nonsleep, nonwork activities were observed in some detail because the literature on isolated habitats has implied that leisure activity should be considered as more than simply being a way of filling-in time.

The HARS data have shown that during the actual missions, recreational facilities in the habitat are among the highest rated of any group of items. As is evident in Table 5-2, analysis of the interviews made it apparent that the primary complaint about recreational facilities after each mission was that there were not enough of them, particularly that there was not enough variety of choice for such recreational activities as listening to recorded music, watching TV films, reading magazine or newspapers, exercise, and snacking. This also is clear in the TEA results.

All aquanauts were asked during debriefing what leisure activities they most enjoyed in the habitat and what they missed most during their stay. Ten points were assigned to each aquanaut on each question, and the various aspects of his answer weighted according to the emphasis the aquanaut put on them in his reply. The results are shown in Tables 5-6 and 5-7.

The missions as presented in these tables are not listed in the chronological order in which they occurred to preserve the anonymity of each crew. Thus Mission A was not necessarily the first mission, or Mission B the second, nor Mission J the last.

Some missions particularly enjoyed certain activities, for example, Mission D especially enjoyed bull sessions, but the two activities most consistently chosen as highly enjoyable were reading leisure books and listening to music on the audio cassettes. At least one aquanaut on every mission mentioned one of these two activities as most enjoyable to him. Games, on the other hand, were not received particularly positively.

One mission was observed in some detail to make a more precise estimate of actual leisure time use in the habitat. The mission, denoted Mission A, is one which according to Dr. Helmreich's observations spent 21.75 percent of their total time in leisure, being very close to the overall average of 20.23 percent. (Of the ten missions, only Mission H was closer to the overall average at 20.27 percent.) Dr. Helmreich's data do not have the detail needed for this particular analysis, however. The observations reported here were gathered in the following way. Mission A was a 14-day mission, and it was observed for 4- or 8-hr periods via video monitoring of the habitat*. The observation period was daily from 4:30 PM to 12:30 PM of the next day, except for days 2, 4, 6, and 11, which only were observed from 4:30PM to 8:30 PM. Observation

*The cooperation of the crew and Dr. Helmreich in allowing these observations is appreciated.

TABLE 5-6

MOST ENJOYED LEISURE ACTIVITIES ACCORDING TO DEBRIEFING
(N = 48)

Activity	Mission										Total
	A	B	C	D	E	F	G	H	I	J	
Reading leisure books	10	21	5	13	15	14	8	7	11	2	106
Audio cassettes (music)	25	20	4	3	5	13	3	11	6	10	100
TV films		1	3		19		17	12	16	8	76
Watching TV monitor			23	4			4	10	6	14	61
Talking about non-mission things	5			30	3				6		44
Spoken arts cassettes							11			12	23
Habitat viewports		7				6	2				15
Writing letters					5	4	2			2	13
Magazines	10										10
Diving					3	2				1	6
Games			5							1	6
Playing musical instrument									5		5
Hobby						4					4
Changing baralyme						4					4
Pot drops						3					3
Napping							3				3
Cooking		1									1

NOTE: (10 points were accorded the response of each aquanaut and divided proportionately to reflect the preferences expressed.)

TABLE 5-7

WHAT AQUANAUTS MISSED MOST
(N = 48)

Item	Mission										Total
	A	B	C	D	E	F	G	H	I	J	
Wife and family	10	17	28	5	20	10	20	20	16	5	151
Women and sex	10	2		40	9	6	10			20	97
Something new and creative to do	12				6		10	10			38
Milk, ice cream	2		1	5			10			10	28
Fresh fruit and vegetables			8			12			4		24
The sun, sunset and sunrise	2	3				4			8	5	22
Alcohol		10			12						22
Friends						16			6		22
Privacy	2								14		16
Access to news	2	3						10			15
Office activities	10	5									15
A good library		10				1					11
Good tasting water			3			1					4
Smoking					3						3
Fresh air									2		2
No answer										10	10

NOTE: (10 points were accorded the response of each aquanaut and divided proportionately to reflect the preferences expressed.)

was constant during these periods. The time period was selected on the probability of it being rich in leisure behaviors. The following were not included in the coding of leisure activity: conversations directly pertinent to the mission, cooking, personal hygiene, eating supper, sleeping (but napping is included), locomoting, swimming for fun when observer not certain, reading book when observer not certain if it is a leisure book, and any other activities not listed in the left hand column of Table 5-8. An activity which was particularly difficult to score was that of listening to audio cassettes. This leisure behavior generally was engaged in while doing something else. Almost invariably there were several aquanauts in a room when the cassettes were played. A fair, although perhaps somewhat conservative, score seemed to derive from the technique of attributing the duration of playing time of the cassette only to the one crew member who put it on the tape recorder, and only to the room where it was playing, even though it generally could be heard in other rooms and by other crew members at the same time.

In the observation periods then a total of 480 man-hours were observed and during this time 1677 leisure acts were noted, occupying a total of 215.53 man-hours. Thus the aquanauts spent 45 percent of their time in leisure activity during the observation times. The average duration of a leisure act was 7.71 minutes.

Three out of five crewmen spent more time conversing than any other single leisure activity.

A total of 6511 minutes of the observed leisure activities occurred on the bridge; 5656 occurred in the crew quarters; 521 in the wet room; 40 in the water; and 204 in the cupola, tunnel, and engine room. More comprehensive tables showing day by day variations in the frequency and duration of specific activities by individual crewmen and by various habitat areas are available upon request.

The most popular leisure activities in various areas of the habitat were as follows:

Crew Quarters--Conversations, watching TV films, and listening to audio cassettes

Bridge--Conversations, listening to audio cassettes, and watching TV films

Wet Room--Conversations

Engine Room--Looking out the viewport at fish and the view, and conversations

Cupola--Looking out at fish and the view.

TABLE 5-8

DISTRIBUTION OF VARIOUS LEISURE ACTIVITIES IN TERMS OF FREQUENCY, LENGTH OF DURATION, TOTAL DURATION, AND LOCATION (MISSION A)

Leisure activity	Number of times observed	Average duration, minutes	Total duration, minutes	Duration in minutes in various locations			
				Bridge	Crew quarters	Wet room	Cupola, tunnel, engine room
Nonmission-relevant conversation between crew	701	5.98	4195	2210	1628	277	80
Listening to audio cassettes	167	12.62	2108	1410	698		
Watching TV films	71	27.45	1949	819	1130		
Snacking	126	4.90	617	120	471	26	
Reading a leisure book	37	15.98	591	170	421		
Leafing through a book or reading a magazine	60	8.52	511	455	56		
Writing a letter	19	21.26	404	145	259		
Napping	6	61.83	371		371		
Looking out viewports	105	2.90	305	139	42	33	91
Resting quietly	24	12.17	292	206	86		
Spontaneous inter-personel actions	38	6.68	254	87	160	6	1
Taking camera pictures	61	3.79	231	123	40	53	15
Watching topside on TV	73	2.56	187	182	5		
Tinkering with personal gear	36	5.14	185	19	139	25	2
Nonmission-relevant conversation with topside	46	3.65	168	56	84	28	
Quietly watching or listening to other crew members	53	3.06	162	82	30	42	8
Playing musical instrument	5	17.40	87	87			

TABLE 5-8.--Concluded

Leisure activity	Number of times observed	Average duration, minutes	Total duration, minutes	Duration in minutes in various locations			
				Bridge	Crew quarters	Wet room	Cupola, tunnel, engine room
Wandering	18	3.72	67	41	7	13	6
Fixing audio or TV tapes	7	8.86	62	55	7		
Physical exercise for fun	3	13.67	41			(water) 40	1
Reading letters	4	10.00	40	28	12		
Looking through leisure facilities for something to do	7	3.71	26	26			
Games	1	21.00	21	21			
Waiting	2	9.00	18			18	
Reading newspaper	2	8.50	17	17			
Sketching	2	6.50	13	13			
Listening to radio	3	3.33	10		10		

The durations of leisure time during the observation periods, by individual crew members, were 3782, 2978, 2549, 1985, and 1646 minutes. This shows a quite considerable range, the crew member engaging in the most leisure activity being recorded as displaying such activities over twice as much as the one who showed the least.

Interview statements concerning leisure activities that were enjoyed most were compared with the data from our observations. Two aquanauts stated they liked the audio cassettes best, two the audio cassettes and the magazines the best, and one liked the books best. Of the four crewmen who liked the audio cassettes, all spent a considerable amount of time listening to them, but the crewman who did not list them as a favorite did not put on one cassette during our observations. This crewman, who stated books were his favorite leisure item, did in fact spend more than twice as much time as any other crewman reading books. The two crewmen who mentioned magazines spent the most time reading magazines of any crewmen. For these crewmen there is good agreement between stated leisure preference in the interview and relative duration engaged in that leisure behavior. However, even though the crewman who liked books best read books considerably more than any other crewman, he still spent more time in conversation than in reading. Similarly, the two crewmen who particularly liked magazines spent more time conversing and watching TV films than reading magazines, even though they did more magazine reading than the others.

RAW DATA

As has been pointed out, environmental psychology is a very new field, and the critical parameters affecting felt quality of life are as yet still not ascertained (refs. 33 and 34). Measurements still cannot fully capture the "feel" of life in a given habitat. Just as other researchers (ref. 35) in this young and developing field, we believe it important to supplement empirical observations with actual records of life in the habitat as undistorted by categories and empirical concepts as possible. Therefore, a sample of 4 to 8 hr of recorded observations on each day of one of the Tektite II missions is available to qualified researchers to allow direct contact with typical behavior and conversations during an actual mission in an isolated habitat. This separate appendix consisting of 160 pages of recorded observations is available on request only to professional people doing research in the areas of habitability or environmental psychology. Anonymity has been protected in this seperate appendix via omission of names and other personal referents.

SECTION 6

CONCLUSIONS

The focal point of this research study had to do with the evaluations of parameters affecting life quality in underwater living in the Tektite II habitat by the 48 men and women who became the aquanauts of the program. These were scientists and engineers of unusual intelligence, imagination, and stability who descended into the habitat with important professional tasks to perform.

A reasonable way to summarize the habitability assessment program is in terms of the initial objectives of the program. These objectives are reviewed below:

WHAT ARE THE KEY BACKGROUND VARIABLES AND CONTEXTUAL VARIABLES WHICH ENHANCE OR DEGRADE HABITABILITY?

Our research is supportive of other psychological research on man-environment relations in isolated environs (e.g.: Nelson; Christenson and Draft; Pope and Rogers) indicating that the goals of users of an isolated habitat will markedly influence their reactions to it. The Tektite habitat had not been designed with this perspective in mind. We can see from the HARS ratings and TEA ratings that the habitat is better designed for goals of comfort than for goals of research. The beds, air conditioning system, shower, carpets, and so on would have made the habitat a pleasant one for those who wanted to use it for a delightful vacation (see pages 5-1 ff.). We see from the same HARS and TEA ratings that the habitat was not well designed for work, particularly for accomplishing the sort of research the scientists using the habitat had hoped to accomplish. The interviews supported these observations, and made it clear that work support was of much more importance to the residents of Tektite II than was comfort support (see pages 5-5 ff.). Thus, in spite of the luxury of the habitat, especially for sleep, eating and leisure, it was generally found to be lower in perceived habitability than we, or its designers, had expected.

The more intelligent and more open aquanauts appear to have circumvented these work problems more effectively than the less intelligent and the less open (see page 5-11).

Furthermore, our research is supportive of other empirical research on man-environment interaction (e.g., Zimbardo) indicating that the factor of personal choice makes considerable difference in evaluation of various aspects of a habitat. Our data show this most clearly with respect to food, where, as will be discussed below, aquanauts had far fewer complaints about self-selected food than they did about high-quality food served on a preprogrammed basis.

Both these parameters, the importance of research support and the importance of choice, were of more importance than we had guessed they would be.

Such findings lead us to reconceptualize our thinking about habitability, away from focusing on just the habitat itself, and toward increasing our attention to the relationship between the inhabitant and the habitat, especially as regards the inhabitant's goals and his perceived sense of ability to influence the habitat according to his needs and preferences.

CAN MEASURES OF HABITABILITY BE DEVELOPED?

This question cannot be completely answered on the basis of this one program. However, it is believed that the techniques employed in this study made progress toward defining those factors that influence habitability in isolated situations. The marine research being conducted by the aquanauts in the situation under study was of advantage in this testing program because the habitat could be evaluated in a more realistic way than could have been the case otherwise. The tests selected proved viable and meaningful in this natural setting. Results should be replicated in other settings, especially with longer mission durations. The importance of replication is particularly strong because simultaneous monitoring of attitudes, moods, overt behavior, and personality organization in a natural setting has been rare in the research of environmental psychology done thus far.

CAN SUCH MEASURES BE USED IN AN ISOLATED HABITAT DURING ACTUAL RESEARCH MISSIONS?

The professionals involved in the use of Tektite II had extensive scientific studies to be completed during their stay in the habitat. These scientists were under strong time pressure and had many unexpected delays and frustrations due to tropical weather and the relative isolation of the Virgin Islands. In spite of this, almost all of the aquanauts were strongly cooperative with us in conducting our habitability research. We feel this was so because (1) we worked hard to make the tests as brief and unintrusive as possible, (2) it was clear to the aquanauts that the habitability project had serious scientific purpose, and (3) the scientists believed that their responses to the tests could be of help to other scientists in isolated habitats at a later date.

HOW IMPORTANT OR DESIRABLE IS PRIVACY? HOW IMPORTANT IS THE PROVISION OF VARIETY?

In spite of the fact that the habitat was designed to insure there would be areas for privacy, especially in the bunks and cupola, and even though mission durations were relatively short and work loads were heavy, areas for private reflection received among the very lowest ratings of the various features of the habitat. Aquanauts stated in the interviews they would have liked more individual and private working space, both for research and for writing, and a number would have liked to have had more opportunity for quiet reflection. Furthermore, a surprising number of interview complaints were made about lack of variety of food, recreational equipment, outside scenery, and types of things to do, and a suprising number of leisure activities consisted of looking out the viewport to see something new. Again, variety scored quite low on the types of support from the habitat rated on the TEA. Thus this study reaffirmed previous observations that privacy and variety have

important impact on habitability. In addition it was observed that there was a tendency toward routinized and flat moods in longer duration isolation. This finding may indicate that the need for variety and privacy, during which the resident can refresh himself from the unvarying atmosphere, becomes increasingly important with prolonged mission duration. (See pages 5-1, 5-13, 5-14, 5-19, and 5-20).

HOW IMPORTANT IS LEISURE TIME, AND IN WHAT KINDS OF ACTIVITIES DO OFF-DUTY CREWMEN ENGAGE?

Leisure time was found to be very important to the aquanauts, who spent more time at leisure activities than they or anyone else had anticipated. The leisure activities were primarily of the unplanned, short-duration type. Leisure activities were observed in all parts of the habitat, but especially in the bridge and crew quarters. Surprisingly, in spite of a good deal of daily exercise, aquanauts would have preferred more room and equipment for active recreation. View ports, audio cassettes, and books are among the leisure items that were well received by the crew because of their capacity to provide novelty in the isolated situation. (See pages 5-15 ff.)

HOW IMPORTANT IS FOOD TO HABITABILITY; WHAT DO CREWMEN ENJOY, AND WHAT DO THEY COMPLAIN ABOUT?

There were far fewer complaints about food when the aquanauts could select their own food, even though the initial reaction to the quality of the preprogrammed food was quite positive. (See page 5-7).

TO WHAT EXTENT DO WORK PROVISIONS INFLUENCE OVERALL ATTITUDE TOWARD THE HABITAT?

The results of this program have led to the conclusion that the single most important variable in the perceived habitability of this habitat was the degree to which aquanauts found the habitat supportive of their scientific and engineering tasks. (See pages 5-5 ff.)

HOW DO CREW REACTIONS TO THE HABITAT CHANGE WITH INCREASED MISSION DURATION?

In general, although the initial impression of the habitat was highly positive, there is a clear tendency for these positive attitudes to decline with increasing lengths of stay in the habitat. Mission duration had a rather strong effect on many of the variables followed in this research. Almost all attitudes concerning life quality in the habitat were less positive in longer duration habitation periods, although the exception was attitude toward topside. Aquanauts shifted toward rather flat and unemotional dispositional states with longer duration stays, and showed less activation and less concentration. They also tended to work less and sleep more in terms of average proportion per day in the longer duration periods. (See pages 5-11 ff.).

HOW IS THE PERSONALITY OF A CREWMAN RELATED TO HIS OPINION OF, OR ADAPTATION TO, THE HABITAT?

The principal personality factors that correlated positively with adaptation to this particular isolated habitat were intelligence and lack of suspiciousness. (See page 5-11.)

DO SCIENTISTS AND ENGINEERS VIEW THE HABITAT DIFFERENTLY?

The data indicate that, for other than task-related considerations, there is no apparent difference between scientists and engineers on any rating or attitude toward the habitat. (See page 5-11 and 5-14.)

DO MEN AND WOMEN VIEW THE HABITAT DIFFERENTLY?

The number of women involved as aquanauts was not large enough to make an empirical statement; however, after inspection and comparison of all measures between men and women, no distinguishing differences were found in their viewpoints of the habitat.

IN IMPROVING THE HABITABILITY OF FUTURE ISOLATED RESEARCH AND LIVING QUARTERS, WHERE DO WE TURN OUR ATTENTION?

The results of this program indicate that compartments utilized by the inhabitants for research must be designed with particular care. Furthermore, the results show that in general, task support, variety of stimuli, privacy, and opportunity for self-selection of foods and activities are key parameters to be provided in the improvement of life quality in isolated habitats.

APPENDIX A

HABITABILITY ASSESSMENT RATING SCALE

APPENDIX A

HABITABILITY ASSESSMENT RATING SCALE

This appendix shows a copy of the habitability assessment rating scale (HARS) designed for rating the Tektite II habitat and other habitats. The form was filled out by the aquanauts while they were still in the habitat, five days before the end of each mission.

PART I

BASIC ITEMS IN HABITAT

These scales are designed to rate 82 basic items common to most habitats, as these items contribute to the quality of life for the residents of the habitat.

Use the following scale* for rating the basic items in your habitat, or the habitat that you are observing:

5 = superlative, considerably better than ordinary, and definitely leading to excellent habitability

4 = very good, better than average, leading to above normal habitability

3 = ordinary, just about what one would expect in the average habitat, helpful in maintaining the quality of life but not in improving it

2 = poor, below average, in some ways injurious to quality of life in the habitat

1 = very poor, far below what one expect in the ordinary habitat, detrimental to quality of life in the habitat

Thus ratings of 4 and 5 are used when a particular aspect of the item is better than ordinary, and ratings of 2 and 1 are for use when it is below the ordinary standard.

For example, if one were rating the furniture used during eating in the habitat, the first aspect to be rated would be: does it perform its function well? A rating of 5 would indicate that the furniture used for eating is exceptional in this respect, perhaps because for various reasons it is especially well designed for mealtime activities; a rating of 4 would indicate that it was above average; 3 would be average; 2 would indicate there is a weak spot or two in the design of the furniture for mealtime activities; and 1 would indicate that the furniture designed for eating does not serve its function well at all in the habitat.

For each item, six aspects are rated and space is provided at the end for comments. The first aspect is performance of function: whether it works as it should and does the job for which it was designed. The second is ease of maintenance: whether cleaning, repairing, and servicing are simple and easy to accomplish. The third is convenience of location: whether the item is normally stored or put in a place where it is accessible but not in the way. The fourth is comfort in use: whether it is comfortable while in use. The fifth is

* The scales presented in this report have been reduced for ease of presentation. Scales used by evaluators had adequate space for pertinent comments.

aesthetic quality: whether the item is attractive and pleasing. The sixth is safety: whether the item is safe and as free from danger as possible.

Please use the column for comments liberally, particularly in explaining ratings of 2 or 1. If an item is nonexistent in the habitat, leave the rating spaces blank, but feel free to comment whatever the circumstance.

AREA A: BIOLOGICAL SUPPORT

The Item	Performance of Function	Ease of Maintenance	Convenience of Location	Comfort in Use	Aesthetically Pleasing	Safety	Comments
Food/Drink							
Plates							
Eating Utensils							
Stove, Burners/Food Preparation Area							
Food Preparation Utensils							
Nonrefrigerated Food Storage Areas							
Refrigerated Food Storage							
Drinking Water Dispenser (if available)							
Furniture Used During Eating							
Medicine							
Storage Area							
Medicines Available							
Hygiene							
Paper Towels, Kleenex, Toilet Paper							
Towels							
Sinks for Hygiene							
Shower							
Bath (if available							
Soaps							
Shaving Equipment							

AREA A: BIOLOGICAL SUPPORT (Continued)

The Item	Performance of Function	Ease of Maintenance	Convenience of Location	Comfort in Use	Aesthetically Pleasing	Safety	Comments
Hygiene (Continued)							
Nail Equipment							
Dental Equipment							
Hair Care Equipment							
Storage Areas for Towels/Hygiene Equipment							
Waste Disposal							
Litter Containers							
Garbage Containers							
Head or Toilet							
Housekeeping							
Vacuum (if available)							
Broom/Mop (if available)							
Window Washing Equipment (if available)							
Sink Cleaning Equipment							
Head Cleaning Equipment							
Ironing Equipment (if available)							
Clothes Cleaning Equipment (if available)							
Storage Areas for Housekeeping Equipment							
Exercise							
Exercise Equipment (if available)							
Areas for Exercise (if available)							

AREA A: BIOLOGICAL SUPPORT (Continued)

The Item	Performance of Function	Ease of Maintenance	Convenience of Location	Comfort in Use	Aesthetically Pleasing	Safety	Comments
Sleep							
Beds							
Sheets and Blankets							
Pillows							
Sleeping Area							
Storage for Sheets, Blankets, etc.							

AREA B: TASK SUPPORT

The Item	Performance of Function	Ease of Maintenance	Convenience of Location	Comfort in Use	Aesthetically Pleasing	Safety	Comments
Equipment for Repairs Tools							
Tool Storage Area							
Reading and Writing Tasks Reading and Writing Areas							
Desks (if available)							
Reading and Writing Storage							
Chairs							
Lamps							
Pens, Pencils, Paper, Stationary, Erasers, etc.							
Typewriter (if available)							
Tables (if available)							
Thinking and Personal Reflection (if available) Area for Private Reflection							
Specialized Task Support (if available) Working Area							
Instruments and Equipment							
Storage							
Clothes Making and Clothes Repair (if available) Sewing Equipment							
Sewing Storage Area							
Task Support in General Working Area							

AREA C: EDUCATIONAL AND INFORMATIONAL

The Item	Performance of Function	Ease of Maintenance	Convenience of Location	Comfort in Use	Aesthetically Pleasing	Safety	Comments
Cook Books (if available)							
Books on Medical Care (if available)							
Equipment Manuals or Directions							
Specialized Task Books (if available)							
Leisure Time Books							
Book Storage Area							
Access to News							
Clocks							

AREA D: RECREATIONAL/LEISURE TIME SUPPORT

The Item	Performance of Function	Ease of Maintenance	Convenience of Location	Comfort in Use	Aesthetically Pleasing	Safety	Comments
Musical Instruments (if available)							
Recorded Music							
Games							
Leisure Time Space							
Television							

AREA E: SOCIAL AND COMMUNICATION SUPPORT

The Item	Performance of Function	Ease of Maintenance	Convenience of Location	Comfort in Use	Aesthetically Pleasing	Safety	Comments
Social Area (e.g., Living Room) Furniture							
Telephone (if available)							
Social Area Layout							

AREA F: MISCELLANEOUS

The Item	Performance of Function	Ease of Maintenance	Convenience of Location	Comfort in Use	Aesthetically Pleasing	Safety	Comments
Floor Coverings							
Clothing Storage							
Curtains, Shades (if available)							
Access to Power							
Access to Water							
Temperature Regulation							
Art or Aesthetic Additions							
Mirrors							
Grooming Area							
Grooming Equipment							

AREA G: GENERAL

The Item	Performance of Function	Ease of Maintenance	Convenience of Location	Comfort in Use	Aesthetically Pleasing	Safety	Comments
The Entire Habitat							

PART 2

AMOUNT OF SENSIBLE VARIETY IN HABITAT

What degree of sensible variety is there in this habitat? Use the following five scales to indicate this by placing a check over the appropriate place on each scale. Use the average habitat of your experience as a point of comparison; that is, a check over the part of the scale labeled "average" would indicate that the habitat you are rating is about the same as most average habitats in amount of variety. Also, along with placing a check on the scale to indicate your rating of the habitat in question, please place an "X" on each scale for where you would put your ideal habitat. Thus you should put two ratings down for each of the five variety scales: the first, a check, will be for the habitat you are now rating: the second, an "X" will be for what you would consider to be the perfect habitat.

Compared to what would be desirable in a habitat, the habitat being rated has what degree of sensible variety? Use the following 5 scales to indicate this:

1. Amount of variety in visual input that is immediately accessible to the eye when standing in a central location in the habitat:

Very little perceivable variety to the eye	An average variety of colors, shapes, contrasts, shades, and movements perceivable to the eye	An unusual amount of perceivable visual input variety

2. Amount of temporal variety in visual input:

A small amount of perceivable temporal visual change	An average amount of visual variety in changes that occur over the time course of a day	An unusually high amount of perceptible change of visual input over time

3. Amount of immediately perceptible variety in sounds:

Very little variety in perceptible sound at most times	An average amount of variety in perceptible sounds	An unusually high amount of variety in perceptible sound

4. Amount of temporal variety in sound:

Very little variation over time in sound	An average amount of variation over time in sound	An unusually high amount of variation over time in sound

5. Amount of immediately perceptible variation in tactile feelings:

Very little tactile variation	An average amount of perceptible tactile variation	An unusually high amount of tactile variation

(It is assumed that there will not be a high amount of tactile variation over time.)

APPENDIX B

TEKTITE II ENVIRONMENTAL ASSESSMENT FORM

APPENDIX B

TEKTITE II ENVIRONMENTAL ASSESSMENT FORM

This appendix shows the Tektite II environmental assessment (TEA) form as taken by the aquanauts. It was filled out four days before the end of each mission.

ENVIRONMENTAL ASSESSMENT

Background

Evaluator:_____ Organization:_____

Specific Status
and/or Duty:_____

Test Type: Pre-mission, Mission, Post-mission
(Circle One)

INSTRUCTIONS

Circle E if your rating is excellent, V for very good, F for fair, and P for poor. Rate whether or not the types of environment support listed in the left column are available in the various activity areas listed along the top. Your comments will be of at least as much help as your ratings. Use the space below the ratings for comments. If additional comments are required please continue on back of rating sheet.

FOLDOUT FRAME 1

FOLDOUT FRAME 2

ENVIRONMENT ASSESSMENT

	SLEEP		FOOD	RECREATION		SOCIAL	WORK				HYGIENE		OVERALL
Support From Habitat	Sleep	Eating	Food Preparation	Exercise and Active Recreation	Games, Books Entertainment	Social Inter-Action	In-Habitat Science Experiments	In-Habitat Repair and Maintenance	Access to Extra Habitat Environment	Work in Extra Habitat Environment	Waste Elimination	Washing, Showering, Body Cleansing	In General
Is there enough room?	E V F P	E V F P	E V F P	E V F P	E V F P	E V F P	E V F P	E V F P	E V F P		E V F P	E V F P	E V F P
Is the lighting of the area satisfactory?	E V F P	E V F P	E V F P	E V F P	E V F P	E V F P	E V F P	E V F P	E V F P	E V F P	E V F P	E V F P	E V F P
Is the site or location of the area used for the activity satisfactory?	E V F P	E V F P	E V F P	E V F P	E V F P	E V F P	E V F P	E V F P	E V F P	E V F P	E V F P	E V F P	
Is the physical layout of the area satisfactory?	E V F P	E V F P	E V F P	E V F P	E V F P	E V F P	E V F P	E V F P	E V F P		E V F P	E V F P	E V F P
Is it quiet enough?	E V F P	E V F P	E V F P	E V F P	E V F P	E V F P	E V F P	E V F P	E V F P		E V F P	E V F P	E V F P
Is there a satisfactory lack of odor?	E V F P	E V F P	E V F P	E V F P	E V F P	E V F P	E V F P	E V F P	E V F P		E V F P	E V F P	E V F P
Is the temperature satisfactory?	E V F P	E V F P	E V F P	E V F P	E V F P	E V F P	E V F P	E V F P	E V F P	E V F P	E V F P	E V F P	E V F P
Is the humidity satisfactory?	E V F P	E V F P	E V F P	E V F P	E V F P	E V F P	E V F P	E V F P	E V F P		E V F P	E V F P	E V F P
Is there enough time allowed?	E V F P	E V F P	E V F P	E V F P	E V F P	E V F P	E V F P	E V F P	E V F P	E V F P	E V F P	E V F P	
Are the times of day available for the activity good ones?	E V F P	E V F P	E V F P	E V F P	E V F P	E V F P	E V F P	E V F P	E V F P	E V F P	E V F P	E V F P	
Is there good selection and good variety?		E V F P		E V F P	E V F P		E V F P						
How does the habitat affect the activity in general?	E V F P	E V F P	E V F P	E V F P	E V F P	E V F P	E V F P	E V F P	E V F P	E V F P	E V F P	E V F P	

APPENDIX C

MOOD ADJECTIVE CHECK LISTS AND BACKGROUND INFORMATION

APPENDIX C

MOOD ADJECTIVE CHECK LIST

This appendix contains the short form of the mood adjective check list (MACL) used daily by the aquanauts. Six different versions of the test were used in approximately equal numbers by the aquanauts, and each of these versions is shown. Background information on the test, taken from unpublished data by Green and by V. Nowlis as indicated, is given in the latter part of this appendix.

ADJECTIVE CHECK LIST

Each of the following words describes feelings or mood. Please use the list to describe your feelings at the moment you read each word. If the word definitely describes how you feel at the moment you read it, circle the double check vv to the right of the word. For example, if the word is relaxed and you are definitely feeling relaxed at the moment, circle the vv as follows:

relaxed (vv) v ? no. (This means you definitely feel relaxed at the moment.)

If the word only slightly applies to your feelings at the moment, circle the single check v as follows:

relaxed vv (v) ? no. (This means you feel slightly relaxed at the moment.)

If the word is not clear to you or you cannot decide whether or not it applies to your feelings at the moment, circle the question mark as follows:

relaxed vv v (?) no. (This means you cannot decide whether you are relaxed or not.)

If you definitely decide the word does not apply to your feelings at the moment, circle the no as follows:

relaxed vv v ? (no) (This means you are definitely not relaxed at the moment.)

Work rapidly. Your first reaction is best. Work down the first column, then go to the next. Please mark all words. This should take only a few minutes. Please begin.

angry	vv	v	?	no
clutched up	vv	v	?	no
carefree	vv	v	?	no
elated	vv	v	?	no
concentrating	vv	v	?	no
drowsy	vv	v	?	no
affectionate	vv	v	?	no
regretful	vv	v	?	no
dubious	vv	v	?	no
boastful	vv	v	?	no
active	vv	v	?	no
defiant	vv	v	?	no
fearful	vv	v	?	no
playful	vv	v	?	no
overjoyed	vv	v	?	no
engaged in thought	vv	v	?	no
sluggish	vv	v	?	no

kindly	vv	v	?	no
sad	vv	v	?	no
skeptical	vv	v	?	no
egotistic	vv	v	?	no
energetic	vv	v	?	no
rebellious	vv	v	?	no
jittery	vv	v	?	no
witty	vv	v	?	no
pleased	vv	v	?	no
intent	vv	v	?	no
tired	vv	v	?	no
warmhearted	vv	v	?	no
sorry	vv	v	?	no
suspicious	vv	v	?	no
self-centered	vv	v	?	no
vigorous	vv	v	?	no

Name: _____ Time: _____

Date: _____ Place: _____

Brief resume of important events which have occured for you in the past hour, or since you last took the ACL:

ADJECTIVE CHECK LIST

Each of the following words describes feelings or mood. Please use the list to describe your feelings at the moment you read each word. If the word definitely describes how you feel at the moment you read it, circle the double check vv to the right of the word. For example, if the word is relaxed and you are definitely feeling relaxed at the moment, circle the vv as follows:

relaxed (vv) v ? no. (This means you definitely feel relaxed at the moment.)

If the word only slightly applies to your feelings at the moment, circle the single check v as follows:

relaxed vv (v) ? no. (This means you feel slightly relaxed at the moment.)

If the word is not clear to you or you cannot decide whether or not it applies to your feelings at the moment, circle the question mark as follows:

relaxed vv v (?) no. (This means you cannot decide whether you are relaxed or not.)

If you definitely decide the word does not apply to your feelings at the moment, circle the no as follows:

relaxed vv v ? (no) (This means you are definitely not relaxed at the moment.)

Work rapidly. Your first reaction is best. Work down the first column, then go to the next. Please mark all words. This should take only a few minutes. Please begin.

boastful	vv	v	?	no						
suspicious	vv	v	?	no	warmhearted	vv	v	?	no	
engaged in thought	vv	v	?	no	sad	vv	v	?	no	
vigorous	vv	v	?	no	pleased	vv	v	?	no	
angry	vv	v	?	no	fearful	vv	v	?	no	
sluggish	vv	v	?	no	witty	vv	v	?	no	
kindly	vv	v	?	no	self-centered	vv	v	?	no	
sorry	vv	v	?	no	dubious	vv	v	?	no	
elated	vv	v	?	no	concentrating	vv	v	?	no	
jittery	vv	v	?	no	energetic	vv	v	?	no	
carefree	vv	v	?	no	rebellious	vv	v	?	no	
egotistic	vv	v	?	no	drowsy	vv	v	?	no	
skeptical	vv	v	?	no	affectionate	vv	v	?	no	
intent	vv	v	?	no	regretful	vv	v	?	no	
active	vv	v	?	no	overjoyed	vv	v	?	no	
defiant	vv	v	?	no	clutched up	vv	v	?	no	
tired	vv	v	?	no	playful	vv	v	?	no	

Name: _____ Time: _____

Date: _____ Place: _____

Brief resume of important events which have occured for you in the past hour, or since you last took the ACL:

ADJECTIVE CHECK LIST

Each of the following words describes feelings or mood. Please use the list to describe your feelings at the moment you read each word. If the word definitely describes how you feel at the moment you read it, circle the double check vv to the right of the word. For example, if the word is relaxed and you are definitely feeling relaxed at the moment, circle the vv as follows:

relaxed (vv) v ? no. (This means you definitely feel relaxed at the moment.)

If the word only slightly applies to your feelings at the moment, circle the single check v as follows:

relaxed vv (v) ? no. (This means you feel slightly relaxed at the moment.)

If the word is not clear to you or you cannot decide whether or not it applies to your feelings at the moment, circle the question mark as follows:

relaxed vv v (?) no. (This means you cannot decide whether you are relaxed or not.)

If you definitely decide the word does not apply to your feelings at the moment, circle the no as follows:

relaxed vv v ? (no) (This means you are definitely not relaxed at the moment.)

Work rapidly. Your first reaction is best. Work down the first column, then go to the next. Please mark all words. This should take only a few minutes. Please begin.

elated	vv	v	?	no	angry	vv	v	?	no
self-centered	vv	v	?	no	carefree	vv	v	?	no
regretful	vv	v	?	no	affectionate	vv	v	?	no
engaged in thought	vv	v	?	no	fearful	vv	v	?	no
active	vv	v	?	no	skeptical	vv	v	?	no
drowsy	vv	v	?	no	pleased	vv	v	?	no
rebellious	vv	v	?	no	egotistic	vv	v	?	no
playful	vv	v	?	no	sorry	vv	v	?	no
kindly	vv	v	?	no	intent	vv	v	?	no
clutched up	vv	v	?	no	energetic	vv	v	?	no
suspicious	vv	v	?	no	sluggish	vv	v	?	no
overjoyed	vv	v	?	no	defiant	vv	v	?	no
boastful	vv	v	?	no	witty	vv	v	?	no
sad	vv	v	?	no	warmhearted	vv	v	?	no
concentrating	vv	v	?	no	jittery	vv	v	?	no
vigorous	vv	v	?	no	dubious	vv	v	?	no
tired	vv	v	?	no					

Name: _____ Time: _____

Date: _____ Place: _____

Brief resume of important events which have occured for you in the past hour, or since you last took the ACL:

ADJECTIVE CHECK LIST

Each of the following words describes feelings or mood. Please use the list to describe your feelings at the moment you read each word. If the word definitely describes how you feel at the moment you read it, circle the double check vv to the right of the word. For example, if the word is relaxed and you are definitely feeling relaxed at the moment, circle the vv as follows:

relaxed (vv) v ? no. (This means you definitely feel relaxed at the moment.)

If the word only slightly applies to your feelings at the moment, circle the single check v as follows:

relaxed vv (v) ? no. (This means you feel slightly relaxed at the moment.)

If the word is not clear to you or you cannot decide whether or not it applies to your feelings at the moment, circle the question mark as follows:

relaxed vv v (?) no. (This means you cannot decide whether you are relaxed or not.)

If you definitely decide the word does not apply to your feelings at the moment, circle the no as follows:

relaxed vv v ? (no) (This means you are definitely not relaxed at the moment.)

Work rapidly. Your first reaction is best. Work down the first column, then go to the next. Please mark all words. This should take only a few minutes. Please begin.

overjoyed	vv	v	?	no
rebellious	vv	v	?	no
active	vv	v	?	no
playful	vv	v	?	no
sad	vv	v	?	no
intent	vv	v	?	no
self-centered	vv	v	?	no
jittery	vv	v	?	no
dubious	vv	v	?	no
drowsy	vv	v	?	no
kindly	vv	v	?	no
elated	vv	v	?	no
angry	vv	v	?	no
energetic	vv	v	?	no
carefree	vv	v	?	no
regretful	vv	v	?	no
concentrating	vv	v	?	no

boastful	vv	v	?	no
fearful	vv	v	?	no
skeptical	vv	v	?	no
sluggish	vv	v	?	no
affectionate	vv	v	?	no
pleased	vv	v	?	no
defiant	vv	v	?	no
vigorous	vv	v	?	no
witty	vv	v	?	no
sorry	vv	v	?	no
engaged in thought	vv	v	?	no
egotistic	vv	v	?	no
clutched up	vv	v	?	no
suspicious	vv	v	?	no
tired	vv	v	?	no
warmhearted	vv	v	?	no

Name: _____ Time: _____

Date: _____ Place: _____

Brief resume of important events which have occured for you in the past hour, or since you last took the ACL:

ADJECTIVE CHECK LIST

Each of the following words describes feelings or mood. Please use the list to describe your feelings at the moment you read each word. If the word definitely describes how you feel at the moment you read it, circle the double check vv to the right of the word. For example, if the word is relaxed and you are definitely feeling relaxed at the moment, circle the vv as follows:

relaxed (vv) v ? no. (This means you definitely feel relaxed at the moment.)

If the word only slightly applies to your feelings at the moment, circle the single check v as follows:

relaxed vv (v) ? no. (This means you feel slightly relaxed at the moment.)

If the word is not clear to you or you cannot decide whether or not it applies to your feelings at the moment, circle the question mark as follows:

relaxed vv v (?) no. (This means you cannot decide whether you are relaxed or not.)

If you definitely decide the word does not apply to your feelings at the moment, circle the no as follows:

relaxed vv v ? (no) (This means you are definitely not relaxed at the moment.)

Work rapidly. Your first reaction is best. Work down the first column, then go to the next. Please mark all words. This should take only a few minutes. Please begin.

regretful	vv	v	?	no
witty	vv	v	?	no
jittery	vv	v	?	no
pleased	vv	v	?	no
energetic	vv	v	?	no
skeptical	vv	v	?	no
sluggish	vv	v	?	no
defiant	vv	v	?	no
kindly	vv	v	?	no
intent	vv	v	?	no
boastful	vv	v	?	no
sorry	vv	v	?	no
carefree	vv	v	?	no
fearful	vv	v	?	no
elated	vv	v	?	no
active	vv	v	?	no
dubious	vv	v	?	no

drowsy	vv	v	?	no
angry	vv	v	?	no
affectionate	vv	v	?	no
engaged in thought	vv	v	?	no
egotistic	vv	v	?	no
sad	vv	v	?	no
playful	vv	v	?	no
clutched up	vv	v	?	no
overjoyed	vv	v	?	no
vigorous	vv	v	?	no
suspicious	vv	v	?	no
tired	vv	v	?	no
rebellious	vv	v	?	no
warmhearted	vv	v	?	no
concentrating	vv	v	?	no
self-centered	vv	v	?	no

Name: _____ Time: _____

Date: _____ Place: _____

Brief resume of important events which have occured for you in the past hour, or since you last took the ACL:

ADJECTIVE CHECK LIST

Each of the following words describes feelings or mood. Please use the list to describe your feelings at the moment you read each word. If the word definitely describes how you feel at the moment you read it, circle the double check vv to the right of the word. For example, if the word is relaxed and you are definitely feeling relaxed at the moment, circle the vv as follows:

relaxed (vv) v ? no. (This means you definitely feel relaxed at the moment.)

If the word only slightly applies to your feelings at the moment, circle the single check v as follows:

relaxed vv (v) ? no. (This means you feel slightly relaxed at the moment.)

If the word is not clear to you or you cannot decide whether or not it applies to your feelings at the moment, circle the question mark as follows:

relaxed vv v (?) no. (This means you cannot decide whether you are relaxed or not.)

If you definitely decide the word does not apply to your feelings at the moment, circle the no as follows:

relaxed vv v ? (no) (This means you are definitely not relaxed at the moment.)

Work rapidly. Your first reaction is best. Work down the first column, then go to the next. Please mark all words. This should take only a few minutes. Please begin.

defiant	vv	v	?	no						
drowsy	vv	v	?	no	jittery	vv	v	?	no	
regretful	vv	v	?	no	dubious	vv	v	?	no	
engaged in thought	vv	v	?	no	pleased	vv	v	?	no	
energetic	vv	v	?	no	affectionate	vv	v	?	no	
boastful	vv	v	?	no	carefree	vv	v	?	no	
clutched up	vv	v	?	no	angry	vv	v	?	no	
suspicious	vv	v	?	no	tired	vv	v	?	no	
elated	vv	v	?	no	sorry	vv	v	?	no	
kindly	vv	v	?	no	intent	vv	v	?	no	
playful	vv	v	?	no	vigorous	vv	v	?	no	
rebellious	vv	v	?	no	self-centered	vv	v	?	no	
sluggish	vv	v	?	no	fearful	vv	v	?	no	
sad	vv	v	?	no	skeptical	vv	v	?	no	
concentrating	vv	v	?	no	overjoyed	vv	v	?	no	
active	vv	v	?	no	warmhearted	vv	v	?	no	
egotistic	vv	v	?	no	witty	vv	v	?	no	

Name: _____ Time: _____

Date: _____ Place: _____

Brief resume of important events which have occured for you in the past hour, or since you last took the ACL:

TABLE C-I

MATCHED AXES IN FIVE GREEN-NOWLIS ANALYSES

Factor and Variable *	Highest Loadings in 5 Analyses	Source of Data				
		I Pre- 3 + 4 + 5	II Pre-2	III Post-2 Hoax	IV Post-3 Comedy	V Post-4 Nuremberg
A, Aggression		Axis No. 1	No. 6	No. 4	No. 5	No. 6
defiant	AAAAA**	30***	50	43	39	56
rebellious	AAAAA	34	44	52	35	54
angry	-gAABA		37	37		39
grouchy	bAAbA		43	30		43
annoyed	iAA-cA		33	44		50
fed-up	aAAtA	14	37	46		45
B, Anxiety		Axis No. 2	No. 9	No. 1	No. 1	No. 3
clutched up	BBBbB	44	32	52	20	35
fearful	BBBbB	40	26	45	18	43
jittery	bBBtB	21	42	37		36
C, Surgency		Axis No. 3	No. 3	No. 5	No. 3	No. 2
carefree	CCCCC	47	36	47	52	33
playful	CCCCC	38	44	47	43	50
witty	CCcCC	48	38	28	32	35
lively	CckCC	33	24		36	30
talkative	CC-hCc	44	30		32	22
C, Elation		Axis No. 8	No. 8	None	None	None
elated	DDccC	45	30			
overjoyed	DDcCC	45	45			
pleased	DD-aCC	40	30			
refreshed	Ddccc	32	23			
E, Concentration		Axis No. 4	No. 4	No. 9	No. 4	No. 1
attentive	-fEEE-n		46	35	58	
earnest	EEeE-n	43	37	24	42	
serious	EEEe-n	58	44	32	28	
comtemplative	EEe-cE	47	37	18		47
concentrating	EEEEe	44	59	36	47	28
engaged in thought	EEEee	51	37	31	25	23
intent	EEEEe	33	46	45	50	24
introspective	Eee-cE	41	23	21		39

(ref. 25 and 26)

* Only 49 of 96 variables are included in this table.

** The letters indicate the factor on which the variable had its highest loading in each analysis. Capital letters indicate values = or > than 0.30; other letters indicate values below 0.30.
An ampersand (&) indicates the variable had loadings = or > 0.30 on two axes in the same matrix.

*** Decimals omitted. The values presented are the highest loading each variable had in each rotated solution.

TABLE C-I.--Concluded

Factor and Variable	Highest Loadings in 5 Analyses	Source of Data				
		I Pre-3+4+5	II Pre-2	III Post-2 Hoax	IV Post-3 Comedy	V Post-4 Nuremberg
F, Fatigue		Axis No. 5	No. 5	No. 2	No. 6	None
drowsy	FFFFg	55	52	38	50	
dull	FFFxx	32	66	30	not used	
sluggish	FFFfg	48	49	37	29	
tired	FFFFg	53	52	33	49	
G, Social Affection		Axis No. 6	No. 2	No. 7	None	No. 5
affectionate	GGGfG	52	51	50		45
forgiving	GGgfG	48	39	21		34
kindly	G-AgeG	46		28		59
warmhearted	GGGeG	43	44	39		49
H, Sadness		None	No. 7	No. 6	No. 2	No. 7
regretful	bHHhH		35	41	28	45
sad	fHHhH		39	44	21	33
sorry	bhHhH		26	39	25	44
I, Skepticism		Axis No. 9	No. 1	None	No. 9	No. 8
dubious	IiF-cB&I	32	26			43
skeptical	IIFIB&I	41	39		52	45
suspicious	IafiB	38			19	(27)
J, Egotism		Axis No. 7	None	No. 8	None	No. 9
egotistic	JbJA-h	45		43		
self-centered	E&JBJeJ	46		49		56
aloof	eajAJ	(22)		17		30
boastful	JaJAj	34		36		23
K, Vigor		None	None	No. 3	None	None
active	-f-fK-fn			31		
energetic	-f-fK-fa			30		
vigorous	-f-fK-fa			41		
N, Nonchalance		None	None	None	No. 7	No. 4
leisurely	FccNn				31	28
nonchalant	CCCNN				37	39

(ref. 25 and 26)

TABLE C-2

FACTORS TENTATIVELY MATCHED ACROSS 15 STUDIES

Factor	5 Green-Nowlis Analyses	2 Green-Nowlis Replic.	2 Borgatta Replic.	2 Thayer Analyses	3 McNair-Lorr Analyses	Reimanis	Matches Tests
A, Aggression	5 Yes	2 Yes	2 Yes	2 Yes	3 Yes	1 Yes	15/15
B, Anxiety	5 Yes	2 Yes	2 ?	2 Yes	3 ?	1 Yes	10/15 + 5 ?
C, Surgency	5 Yes	1 Yes	No Test	No Test	No Test	No Test	6/7
D, Elation	2 Yes	2 No	2 ?	1 Yes	No Test	1 Yes	4/12 + 2 ?
E, Concentration	5 Yes	2 Yes	2 Yes	2 Yes	1 Yes 2 No Test	1 ?	12/13 + 1 ?
F, Fatigue	4 Yes	2 Yes	2 Yes	2 Yes	3 Yes	1 Yes	14/15
G, Social Affection	4 Yes	2 Yes	2 Yes	1 Yes	1 Yes 2 No Test	1 No	10/13
H, Sadness	4 Yes	1 Yes	2 ?	2 Yes	3 ?	1 ?	7/15 + 6 ?
I, Skepticism	4 Yes	No Test	1 ?	2 Yes	No Test	No Test	6/9 + 1 ?
J, Egotism	3 Yes	1 Yes 1 ?	1 Yes	2 Yes	No Test	1 ?	7/12 + 2 ?
K, Vigor or General Activation	1 ?	2 No	No Test	2 Yes	3 Yes	1 Yes	6/13 + 1 ?
N, Nonchalance or General Deactivation	2 ?	No Test	No Test	2 Yes	No Test	No Test	2/7 + 2 ?

(ref. 25 and 26)

TABLE C-3

SOCIAL DESIRABILITY OF TEN MOOD FACTORS

Factor	Males	Females
Social Affection (G)	6.0	6.3
Concentration (E)	5.9	6.0
Pleasantness (D)	5.3	5.5
Surgency (C)	5.1	5.3
Depression (H)	3.0	3.0
Anxiety (B)	2.5	2.4
Fatigue (F)	2.5	2.6
Skepticism (I)	2.4	2.4
Aggression (A)	2.2	2.0
Egotism (J)	2.0	2.0

(ref. 25 and 26)

TABLE C-4

DIFFERENCE SCORES FOR INDIVIDUAL VARIABLES IN TWELVE FACTORS IN SIX DIFFERENT EXPERIMENTAL SESSIONS

Factor	One: Lincoln	Two: Hoax	Three: Comedy	Four: Nuremberg	Five: Operation	Six: Contest
A, Aggression						
defiant	-.06	.34	.02	.78	-.11	.08
rebellious	-.14	.30	.08	.69	-.11	.01
angry	-.03	.41	-.13	1.56	.00	.08
grouchy	-.24	.44	-.29	.25	-.12	.15
annoyed	-.06	.61	-.38	1.06	.03	.10
fed up	-.23	.41	-.33	.68	-.14	-.01
(Mean)	(-.13)	(.42)	(-.17)	(.84)	(-.08)	(.07)
B, Anxiety						
clutched up	-.16	.00	-.05	.48	.29	.13
fearful	.01	.02	-.01	.74	.26	.14
jittery	-.15	-.18	.04	.40	.32	.05
(Mean)	(-.10)	(-.05)	(-.01)	(.54)	(.29)	(.11)
C, Surgency						
carefree	-.37	-.10	.59	-.99	-.62	-.36
playful	-.45	-.18	.73	-1.06	-.60	-.43
witty	-.44	-.22	.38	-.94	-.62	-.42
lively	-.19	-.26	.64	-.73	-.12	-.30
talkative	-.25	-.02	.34	-.68	-.22	-.40
(Mean)	(-.34)	(-.16)	(.54)	(-.88)	(-.44)	(-.38)
D, Elation						
elated	.00	-.24	.74	-.78	-.32	-.23
overjoyed	.06	-.21	.95	-.61	-.29	-.18
pleased	.09	-.47	.84	-1.15	-.36	-.16
refreshed	-.03	-.40	.64	-.78	-.31	-.27
(Mean)	(.03)	(-.33)	(.79)	(-.83)	(-.32)	(-.21)
E, Concentration						
concentrating	.05	-.29	-.30	.45	.30	.15
engaged in thought	.20	-.21	-.43	.90	.44	.24
intent	-.01	-.24	-.10	.35	.22	.00
attentive	.00	-.31	-.04	.39	.30	.06
earnest	.07	-.34	-.25	.24	.12	.04
serious	.19	-.26	-.80	.82	.49	.18
contemplative	.36	-.22	-.48	.68	.41	.13
introspective	.05	-.11	-.29	.28	.20	.01
(Mean)	(.11)	(-.21)	(-.30)	(.46)	(.27)	(.08)

(ref. 25 and 26)

TABLE C-4.--Concluded

Factor	One: Lincoln	Two: Hoax	Three: Comedy	Four: Nuremberg	Five: Operation	Six: Contest
F, Fatigue						
drowsy	.03	.24	-.29	-.11	-.08	.33
dull	-.11	.24	-.24	-.06	-.11	.14
sluggish	-.05	.23	-.24	-.04	-.08	.24
tired	-.08	.34	-.30	-.01	-.10	.26
(Mean)	(-.05)	(.26)	(-.27)	(-.06)	(-.09)	(.24)
G, Social Affection						
affectionate	-.15	-.23	.16	-.61	-.23	-.20
forgiving	.01	-.23	-.08	-.60	-.05	-.24
kindly	.05	-.39	.20	-.70	-.09	-.20
warmhearted	.11	-.39	.31	-.74	-.22	-.26
(Mean)	(.00)	(-.31)	(.15)	(-.66)	(-.15)	(-.23)
H, Sadness						
regretful	.22	.22	-.18	1.17	.09	.14
sad	.29	.08	-.22	1.28	.13	.05
sorry	.21	-.01	-.08	1.24	.14	.06
(Mean)	(.24)	(.10)	(-.16)	(1.23)	(.12)	(.08)
I, Skepticism						
dubious	-.37	-.02	-.26	.23	-.07	.13
skeptical	-.40	.07	-.35	.19	.02	.12
suspicious	-.22	.10	-.18	.47	.01	.11
(Mean)	(-.33)	(.05)	(-.29)	(.30)	(-.01)	(.12)
J, Egotism						
egotistic	-.36	-.02	-.05	-.34	-.20	-.03
self-centered	-.23	-.01	-.14	-.27	-.15	-.02
aloof	-.11	-.61	-.13	-.20	-.18	-.08
boastful	-.22	-.01	.18	-.36	-.18	-.15
(Mean)	(-.23)	(-.16)	(-.04)	(-.29)	(-.18)	(-.07)
K, Vigor (?)						
active	-.31	-.26	.37	-.23	-.19	-.05
energetic	-.11	-.33	.41	-.24	-.22	-.28
vigorous	-.18	-.21	.39	-.18	-.14	-.12
(Mean)	(-.20)	(-.27)	(.39)	(-.22)	(-.18)	(-.15)
N, Nonchalance						
nonchalant	-.26	-.34	-.12	-.97	-.53	-.30
leisurely	-.47	-.24	-.15	-.94	-.60	-.30
(Mean)	(-.37)	(-.29)	(-.14)	(-.96)	(-.57)	(-.30)

(ref. 25 and 26)

TABLE C-5

PERCENTAGE OF SIGNIFICANT CORRELATIONS BETWEEN MOOD FACTOR SCORES AND 45 SUBTESTS OF THE MMPI, CATTELL 16 PF TEST, AND THREE GUILFORD INVENTORIES

	MMPI	Cattell	Guilford	Total
2nd MACL	25	10	13	16
Next to last MACL	23	15	25	21
Mean daily MACL	20	09	15	14
Standard Deviation of daily MACL	20	10	25	18
Total	22	11	19	17

(ref. 25 and 26)

APPENDIX D

CATTELL 16 PF QUESTIONNAIRE

APPENDIX D

CATTELL 16 PF QUESTIONNAIRE

The Cattell 16 Personality Factor (16 PF) Questionnaire, Form B, was used with the aquanauts. This form, together with an answer sheet and a scoring sheet is shown.

1967-68 EDITION

FORM B

16 PF

WHAT TO DO: Inside this booklet are some questions to see what attitudes and interests you have. There are no "right" and "wrong" answers because everyone has the right to his own views. To be able to get the best advice from your results, you will want to answer them exactly and truly.

If a separate "Answer Sheet" has not been given to you, turn this booklet over and tear off the Answer Sheet on the back page.

Write your name and all other information asked for on the top line of the Answer Sheet.

First you should answer the four sample questions below so that you can see whether you need to ask anything before starting. Although you are to read the questions in this booklet, you must record your answers on the answer sheet (alongside the same number as in the booklet).

There are three possible answers to each question. Read the following examples and mark your answers at the top of your answer sheet where it says "Examples." Fill in the left-hand box if your answer choice is the "a" answer, in the middle box if your answer choice is the "b" answer, and in the right-hand box if you choose the "c" answer.

EXAMPLES:

1. I like to watch team games.
   a. yes, b. occasionally, c. no.

2. I prefer people who:
   a. are reserved,
   b. (are) in between,
   c. make friends quickly.

3. Money cannot bring happiness.
   a. yes (true), b. in between, c. no (false).

4. Woman is to child as cat is to:
   a. kitten, b. dog, c. boy.

In the last example there *is* a right answer—kitten. But there are very few such reasoning items.

Ask *now* if anything is not clear. The examiner will tell you in a moment to turn the page and start.

When you answer, keep these four points in mind:

1. You are asked not to spend time pondering. **Give the first, natural answer as it comes to you.** Of course, the questions are too short to give you all the particulars you would sometimes like to have. For instance, the above question asks you about "team games" and you might be fonder of football than basketball. But you are to reply "for the average game," or to strike an average in situations of the kind stated. Give the best answer you can at a rate not slower than five or six a minute. You should finish in a little more than half an hour.
2. Try **not** to fall back on the middle, "uncertain" answers except when the answer at either end is really **impossible** for you—perhaps once every four or five questions.
3. Be sure not to skip anything, **but answer every question, somehow.** Some may not apply to you very well, but give your best guess. Some may seem personal; but remember that the answer sheets are kept confidential and cannot be scored without a special stencil key. Answers to particular questions are not inspected.
4. Answer as honestly as possible what is true of **you.** Do not merely mark what seems "the right thing to say" to impress the examiner.

DO NOT TURN PAGE UNTIL TOLD TO DO SO

16 PF-Btb-9AA

1. I have the instructions for this test clearly in mind.
   a. yes, b. uncertain, c. no.

2. I am ready to answer each question as truthfully as possible.
   a. yes, b. in between, c. no.

3. For a vacation I would rather go to:
   a. a busy holiday town,
   b. something in between a. and c.,
   c. a quiet cottage off the beaten track.

4. When I'm in a small, cramped space (as on a crowded elevator), I have an uncomfortable feeling of being "shut in."
   a. never, b. rarely, c. occasionally.

5. I find myself thinking over quite trivial troubles again and again and have to make a real effort to put them out of my mind.
   a. yes (true),
   b. occasionally,
   c. no (false).

6. If I know that another person's line of reasoning is in error, I tend to:
   a. keep quiet,
   b. in between,
   c. speak out.

7. My ideas appear to be:
   a. ahead of the times,
   b. uncertain,
   c. with the times.

8. I am not much given to cracking jokes and telling amusing stories.
   a. true, b. in between, c. false.

9. It is better to live to a ripe old age than to be worn out with good services for one's community.
   a. true, b. in between, c. false.

10. I have been active in organizing a club, team, or similar social group.
    a. yes, often, b. occasionally, c. never.

11. I just can't help feeling sentimental.
    a. very rarely, b. sometimes, c. often.

12. I would rather read a book on:
    a. Great Religious Teachings,
    b. uncertain,
    c. Our National Political Organization.

13. The topics on which I am "touchy" or easily annoyed are very few.
    a. true, b. uncertain, c. false.

14. The abilities and characteristics inherited from the parents are more important than many people are ready to admit.
    a. true, b. in between, c. false.

15. I feel that routine jobs should always be completed, even when a bit of imagination shows it is not necessary.
    a. true, b. uncertain, c. false.

16. Jokes about death are all right and normally in good taste.
    a. yes, b. in between, c. no.

17. I like to be told the best way to do things instead of finding out for myself.
    a. yes, b. uncertain, c. no.

18. In the midst of social groups, I am nevertheless sometimes overcome by feelings of loneliness and worthlessness.
    a. yes, b. in between, c. no.

19. My memory does not change much from day to day.
    a. true, b. sometimes, c. false.

20. I believe in complaining to the waiter or manager if I am served poor food in a restaurant.
    a. yes, b. uncertain, c. no.

21. For relaxation I prefer:
    a. sports or games,
    b. uncertain,
    c. debates and intellectual games.

22. I have, compared with others, participated in:
    a. many community and social activities,
    b. several,
    c. only a few community and social activities.

23. When I make plans, I often like to leave things to chance.
    a. true, b. uncertain, c. false.

24. In going places, eating, working, etc., I:
    a. seem to rush from one thing to another,
    b. in between,
    c. go on in a deliberate, methodical way.

25. I feel restless as if I want something but do not know what.
    a. very rarely, b. occasionally, c. often.

(End, column 1 on answer sheet.)

26. In a factory, it would be more interesting to be in charge of:
a. mechanical matters,
b. uncertain,
c. interviewing and hiring people.

27. I would prefer to read a book on:
a. travel in outer space,
b. uncertain,
c. education within the family.

28. Which of the following words is not the same kind as the others?
a. dog, b. bird, c. cow.

29. If I had my life to live over again, I would:
a. plan it differently,
b. uncertain,
c. want it much the same.

30. In making decisions in my life and work, I was never troubled by lack of understanding on the part of my family.
a. true, b. in between, c. false.

31. I like to avoid saying unusual things that embarrass people.
a. true, b. in between, c. false.

32. If I had a gun in my hand that I knew was loaded, I would feel nervous until I unloaded it.
a. yes, b. in between, c. no.

33. I greatly enjoy playing practical jokes with no malice in them.
a. true, b. in between, c. false.

34. People use up too much of their leisure in neighborly duties and helping with local affairs.
a. yes, b. uncertain, c. no.

35. Sometimes I feel that I don't do so well as I should socially, because I'm unsure of myself.
a. true, b. in between, c. false.

36. I enjoy getting into conversation, and I rarely let a chance go by to speak to a stranger.
a. true, b. in between, c. false.

37. The newspaper headline that would interest me more is:
a. "Religious Leaders Discuss a Unified Creed,"
b. uncertain,
c. "Improvements in Production and Marketing."

38. I doubt the honesty of people who are more friendly than I would expect them to be.
a. true, b. in between, c. false.

39. My advice for people is:
a. go ahead and try; it won't hurt!
b. in between,
c. think it over first; don't make a fool of yourself!

40. It is more important for me:
a. to express myself freely,
b. in between,
c. to have good relations with other people.

41. I enjoy daydreaming.
a. yes, b. uncertain, c. no.

42. I like a job that presents me with some subtle decisions rather than one with quick, routine answers.
a. true, b. uncertain, false.

43. I have a feeling that my friends don't need me so much as I need them.
a. true, b. uncertain, c. false.

44. If somebody thought badly of me, I would worry about this:
a. hardly ever,
b. occasionally,
c. quite often.

45. I have had accidents because I was deep in thought.
a. hardly ever,
b. in between,
c. several times.

46. In my newspaper, I like to see:
a. discussion of basic social issues in the modern world,
b. in between,
c. good coverage of all local news.

47. I find books more entertaining than companions.
a. yes, b. in between, c. no.

48. However difficult and unpleasant the obstacles, I always persevere and stick to my original intentions.
a. yes, b. in between, c. no.

49. My nerves get on edge, so that certain sounds, for example, a screechy hinge, are unbearable and give me the "shivers."
a. often, b. sometimes, c. never.

50. I often feel quite tired when I get up in the morning.
a. yes, b. in between, c. no.

(End, column 2 on answer sheet.)

51. With equal salary, I would enjoy more being:
a. a research chemist,
b. uncertain,
c. a hotel manager (or manageress).

52. Going around selling things, or asking for funds to help a cause I believe in, is, for me:
a. quite enjoyable,
b. in between,
c. an unpleasant job.

53. Which one of the following three numbers does not belong with the others?
a. 7, b. 9, c. 13.

54. "Dog" is to "bone" as "cow" is to:
a. milk, b. grass, c. salt,

55. Changes in weather don't usually affect my efficiency and mood.
a. true, b. in between, c. false.

56. In a strange city, I would:
a. walk wherever I liked,
b. uncertain,
c. avoid the parts of the town said to be dangerous.

57. It is more important to:
a. get along smoothly with people,
b. in between,
c. get your own ideas put into practice.

58. I believe in:
a. the motto "laugh and be merry" on most occasions,
b. in between,
c. being properly serious in everyday business.

59. When given a set of rules, I follow them when personally convenient, rather than exactly to the letter.
a. true, b. uncertain, c. false.

60. In my social relations, I am sometimes troubled by a sense of inferiority, for which there is no real cause.
a. true, b. in between, c. false.

61. I feel a bit awkward in company and don't show up quite so well as I should.
a. yes, b. sometimes, c. no.

62. I would rather:
a. work with several people under me,
b. uncertain,
c. work with a committee.

63. Even when the blame can be put on others, most people don't mind admitting their guilt.
a. true, b. uncertain, c. false.

64. No one would really like to see me in trouble.
a. true, b. uncertain, c. false.

65. It is more important for a man to be concerned about:
a. the basic meaning of life,
b. uncertain,
c. making a good income for his family.

66. Being indoors long, away from the fresh outdoors, makes me feel stale.
a. always, b. sometimes, c. hardly ever.

67. I get unusual ideas about all sorts of things — too many to put into practice.
a. true, b. sometimes, c. false.

68. My spirits generally stay high, no matter how much trouble I meet.
a. true, b. in between, c. false.

69. I have difficulty falling asleep at night through worrying about an unfortunate incident.
a. often, b. occasionally, c. seldom.

70. I would rather see:
a. a clever movie farce or skit on the society of the future,
b. in between,
c. a good movie of hardy, pioneering days.

71. My friends probably think it is hard to get to know me really well.
a. yes, b. in between, c. no.

72. I solve a problem better by:
a. studying it alone,
b. in between,
c. discussing it with others.

73. When quick decisions must be made, I:
a. rely on calm, logical, and objective reasoning,
b. in between,
c. become tense and excitable, unable to think clearly.

74. I sometimes find quite useless thoughts and memories straying through my mind.
a. yes, b. in between, c. no.

75. I never find myself so annoyed in discussions that I can't control my voice.
a. true, b. uncertain, c. false.

(End, column 3 on answer sheet.)

76. When traveling, I would rather look at the scenery than talk to people.
a. true, b. uncertain, c. false.

77. Is "lose" a better opposite to "reveal" than "hide"?
a. yes, b. uncertain, c. no.

78. "Black" is to "gray" as "pain" is to:
a. sprain, b. ache, c. itch.

79. I find it hard to "take 'no' for an answer," even when I know I'm asking the impossible.
a. true, b. in between, c. false.

80. I am often hurt more by the way people say things than by what they say.
a. true, b. in between, c. false.

81. It embarrasses me to have servants waiting on me.
a. yes, b. in between, c. no.

82. When friends are in a lively conversation, I:
a. prefer sometimes to be a shrewd listener,
b. in between,
c. get more remarks in than most people.

83. I like being in the middle of a great deal of excitement and bustle.
a. yes, b. in between, c. no.

84. At work it is really more important to be popular with the right people than to do a first-rate job.
a. true, b. in between, c. false.

85. If people in the street, or in a store, watch me, I feel slightly embarrassed.
a. yes, b. in between, c. no.

86. My ideas can't always be easily put into words, so I don't cut into a conversation as readily as most people do.
a. true, b. in between, c. false.

87. I am always interested in mechanical matters, for example, in cars or airplanes.
a. yes, b. in between, c. no.

88. It is mainly the fear of being caught that keeps most people from dishonest or criminal acts.
a. yes, b. in between, c. no.

89. There are really more nice people than objectionable people in the world.
a. yes, b. uncertain, c. no.

90. Careless folks who say "the best things in life are free" usually haven't worked to get much.
a. true, b. in between, c. false.

91. In a committee, if people just talk without coming to the point, I:
a. urge them to get to the point,
b. uncertain,
c. do what's practical to keep harmony.

92. A person whose ambitions hurt and damage a close friend may still be considered an ordinary, decent citizen.
a. yes, b. in between, c. no.

93. When one small thing after another goes wrong, I:
a. go on as usual,
b. in between,
c. feel overcome.

94. I am troubled by feelings of guilt or remorse over quite small matters.
a. yes, often, b. sometimes, c. no.

95. It would be better if everyone got together in public worship regularly.
a. true, b. in between, c. false.

96. In planning social outings, I:
a. am always happy to commit myself entirely,
b. in between,
c. like to reserve the right to cancel my going.

97. Many people talk over their problems and ask advice of me when they need someone to talk to.
a. yes, b. in between, c. no.

98. If my friends leave me out of something they are doing, I:
a. make a fuss,
b. in between,
c. take it calmly, thinking they have some reason.

99. In some moods I'm easily kept from working by distractions and daydreams.
a. yes, b. in between, c. no.

100. I don't form immediate likes and dislikes for people I have just met.
a. true, b. uncertain, c. false.

(End, column 4 on answer sheet.)

101. I'd enjoy more being:
a. a business office manager,
b. uncertain,
c. an architect.

102. "April" is to "March" as "Tuesday" is to:
a. Wednesday, b. Friday, c. Monday.

103. Which of the following words does not belong with the others?
a. wise, b. lovely, c. kind.

104. I cross the street to avoid meeting people I don't feel like seeing.
a. never, b. seldom, c. sometimes.

105. In an average day, the number of problems I meet that I can't solve on my own is:
a. hardly one,
b. in between,
c. more than half a dozen.

106. If I disagree with a superior on his views, I usually:
a. keep my opinion to myself,
b. uncertain,
c. tell him that my opinion differs.

107. I avoid any embarrassing topic in talking with members of the opposite sex.
a. true, b. in between, c. false.

108. I am not really successful in dealing with people.
a. true, b. uncertain, c. false.

109. I enjoy giving my best time and energy to:
a. my home and the real needs of my friends,
b. in between,
c. social activities and personal hobbies.

110. When I wish to impress people favorably with my personality, I:
a. nearly always succeed,
b. sometimes succeed,
c. am generally uncertain of success.

111. I prefer to have:
a. a large circle of acquaintances,
b. uncertain,
c. just a few, well-tried friends.

112. It would be more interesting to be a philosopher than a mechanical engineer.
a. true, b. uncertain, c. false.

113. I tend to be critical of other people's work.
a. yes, b. occasionally, c. no.

114. I enjoy planning carefully to influence my associates so that they will help me in achieving my goals.
a. true, b. in between, c. false.

115. I think I am more sensitive than most people to the artistic quality of my surroundings.
a. yes, b. uncertain, c. no.

116. My friends think I am slightly absent-minded and impractical.
a. yes, b. uncertain, c. no.

117. With acquaintances I prefer to:
a. keep to matter-of-fact, impersonal things,
b. in between,
c. chat about people and their feelings.

118. I am sometimes so very happy that I get afraid my happiness cannot last.
a. true, b. in between, c. false.

119. I occasionally have periods of feeling depressed, miserable, and in low spirits for no sufficient reason.
a. yes, b. in between, c. no.

120. In my work more troubles arise from people who:
a. are constantly changing methods that are already O.K.,
b. uncertain,
c. refuse to employ up-to-date methods.

121. I like my acquaintances to think of me as one of the group.
a. true, b. in between, c. false.

122. When looking for a place in a strange city, I would:
a. just ask people where places are,
b. in between,
c. take a map with me.

123. I sometimes stir up friends to go out when they say they really want to stay home.
a. yes, b. uncertain, c. no.

124. When pushed and overworked, I suffer from indigestion or constipation.
a. occasionally, b. hardly ever, c. never.

125. If someone annoys me, I:
a. can keep it to myself,
b. in between,
c. must speak to someone else "to let off steam."

(End, column 5 on answer sheet.)

126. It would be more interesting to be an insurance salesman than a farmer.
a. yes, b. in between, c. no.

127. "Statue" is to "shape" as "song" is to:
a. beauty, b. notes, c. tune.

128. Which of the following words does not belong with the others?
a. hum, b. speak, c. whistle.

129. Modern life has too many annoying frustrations and restrictions.
a. true, b. in between, c. false.

130. I feel ready for life and its demands.
a. always, b. sometimes, c. hardly ever.

131. I honestly think I am more planful, energetic, and ambitious than many perhaps equally successful people.
a. yes, b. occasionally, c. no.

132. Nearly always I have a craving for more excitement.
a. true, b. in between, c. false.

133. It would be more interesting to be:
a. an actor,
b. uncertain,
c. a house builder.

134. I find it desirable to make plans to avoid waste of time between jobs.
a. yes, b. in between, c. no.

135. In a group I am usually:
a. well in touch with all that goes on around me,
b. in between,
c. wrapped up in my own thoughts or immediate business.

136. In joining a new group, I seem to fit in immediately.
a. yes, b. uncertain, c. no.

137. I greatly enjoy the racy and slap-stick humor of some television shows.
a. yes, b. in between, c. no.

138. I would rather read about:
a. the discovery of very old Indian paintings,
b. uncertain,
c. Indian murders.

139. In ordinary difficulties, I generally keep up hope.
a. yes, b. uncertain, c. no.

140. I am less interested in being practically and financially successful than in seeking artistic and spiritual truths.
a. true, b. in between, c. false.

141. I would rather read:
a. a good historical novel,
b. in between,
c. an essay by a scientist on harnessing world resources.

142. In discussing art, religion, or politics, I seldom get so involved or excited that I forget politeness and human relations.
a. true, b. uncertain, c. false.

143. When I am going to catch a train, I get a little hurried, tense, or anxious, though I know I have time.
a. yes, b. sometimes, c. no.

144. I like to tackle problems that other people have made a mess of.
a. yes, b. in between, c. no.

145. Society should be guided more by logical thinking and less by sentimental, traditional beliefs.
a. yes, b. in between, c. no.

146. When I do what I want, I find I'm generally:
a. understood only by close friends,
b. in between,
c. doing what most people think is O.K.

147. I tend to get over-excited and "rattled" in upsetting situations.
a. yes, b. in between, c. no.

148. I make a point of not being absent-minded, or forgetful of details.
a. yes, b. in between, c. no.

149. A near-accident, or even a lively argument, sometimes leaves me shaky and exhausted, so that I can't settle down to what I was doing.
a. true, b. in between, c. false.

150. I find my feelings boiling up inside:
a. rarely, b. occasionally, c. quite often.

(End, column 6 on answer sheet.)

151. For a pleasant hobby I would rather belong to:
a. a photography club,
b. uncertain,
c. a debating society.

152. "Combine" is to "mix" as "team" is to:
a. crowd, b. army, c. game.

153. "Clock" is to "time" as "tailor" is to:
a. tape measure, b. scissors, c. cloth.

154. I have difficulty in following what some people are trying to say because of their odd use of common words.
a. yes, b. in between, c. no.

155. Prosecuting lawyers are mainly interested in:
a. making convictions, regardless of the person,
b. uncertain,
c. protecting the innocent.

156. People have sometimes called me a proud, "stuck-up" individual.
a. yes, b. in between, c. no.

157. It would be more interesting to live the life of a master printer than that of an advertising man and promoter.
a. true, b. uncertain, c. false.

158. I tend to speak rather slowly.
a. yes, b. sometimes, c. no.

159. When I do something, my main concern is that:
a. it is really what I want to do,
b. uncertain,
c. there will be no bad results for my associates.

160. I think most stories and movies should teach us a good moral.
a. true, b. in between, c. false.

161. Starting conversations with strangers:
a. is rather difficult for me,
b. in between,
c. never gives me the least trouble.

162. Upsetting the dignity of teachers, judges, and "cultured" people always amuses me.
a. yes, b. in between, c. no.

163. On television, I would rather watch:
a. a great concert artist,
b. uncertain,
c. a practical, informative program on new inventions.

164. I get irritated by people who adopt morally superior attitudes.
a. yes, b. in between, c. no.

165. I would rather spend time enjoying:
a. a game of cards with a congenial group,
b. uncertain,
c. the beautiful things in an art gallery.

166. I sometimes hesitate to use my own ideas, for fear they might be impractical.
a. yes, b. in between, c. no.

167. I am always polite and diplomatic with unreasonable, unimaginative people and do not believe in showing up how narrow-minded they are.
a. true, b. in between, c. false.

168. I would rather live in an up-and-coming town than in a quiet country village.
a. true, b. uncertain, c. false.

169. When I differ with someone on social views, I like:
a. to find out basically what our difference means,
b. uncertain,
c. just to reach some practical solution, satisfactory to both.

170. I think people should hesitate longer before they condemn the wisdom of the past.
a. yes, b. uncertain, c. no.

171. I get as many ideas from reading a book myself as from discussing its topics with others.
a. yes, b. in between, c. no.

172. Some people criticize my sense of responsibility.
a. yes, b. uncertain, c. no.

173. I would rate myself:
a. an alert, practical person,
b. in between,
c. more of a dreamer.

174. On occasions, my emotions and feelings "run away with me."
a. true, b. uncertain, c. false.

175. I feel so furious I want to slam a door, and maybe break a window:
a. very rarely,
b. occasionally,
c. fairly frequently.

(End, column 7 on answer sheet.)

176. I would enjoy better:
a. being in charge of children's games,
b. uncertain,
c. helping a watchmaker.

177. "Justice" is to "laws" as "idea" is to:
a. words, b. feelings, c. theories.

178. Which of the following words does not belong with the others?
a. second, b. once, c. alone.

179. I would prefer to lead:
a. the same kind of life I now lead,
b. uncertain,
c. a more sheltered life, with fewer difficulties to face.

180. I believe that the most important thing in life is to do what I like.
a. yes, b. uncertain, c. no.

181. My speaking voice is:
a. strong, b. in between, c. soft.

182. I like acting on impulses of the moment, even if they land me in later difficulties.
a. yes, b. in between, c. no.

183. I am well described as a happy-go-lucky, nonchalant person.
a. yes, b. in between, c. no.

184. I greatly dislike the sight of disorder.
a. true, b. uncertain, c. false.

185. I always check very carefully the condition in which borrowed property is returned, to me or by me to others.
a. yes, b. in between, c. no.

186. In social groups I am bothered by self-conscious shyness.
a. never, b. sometimes, c. often.

187. I am sure there are no questions that I have not answered properly.
a. yes, b. uncertain, c. no.

(End of test.)

IPAT

ANSWER SHEET: THE 16 P. F. TEST, FORM B

EXAMPLES

1. I like to watch team games.
   a. yes, b. occasionally, c. no.
2. I prefer people who:
   a. are reserved,
   b. (are) in between,
   c. make friends quickly.
3. Money cannot bring happiness.
   a. yes (true),
   b. in between,
   c. no (false).
4. Woman is to child as cat is to:
   a. kitten, b. dog, c. boy.

1 ☐ ☐ ☐
2 ☐ ☐ ☐
3 ☐ ☐ ☐
4 ☐ ☐ ☐

NAME _____ (First) (Middle) (Last) ★

SEX _____ (Write M or F) AGE _____ (Nearest Year) DATE _____

| | | |

16 PF TEST PROFILE

FACTOR	Raw Score: Form A	Raw Score: Form B	Raw Score: Total	Standard Score	LOW SCORE DESCRIPTION	STANDARD TEN SCORE (STEN) 1 2 3 4 5 6 7 8 9 10 (Average)	HIGH SCORE DESCRIPTION
A					**RESERVED,** DETACHED, CRITICAL, ALOOF (Sizothymia)		**OUTGOING,** WARMHEARTED, EASY-GOING, PARTICIPATING (Affectothymia, formerly cyclothymia)
B					**LESS INTELLIGENT,** CONCRETE-THINKING (Lower scholastic mental capacity)		**MORE INTELLIGENT,** ABSTRACT-THINKING, BRIGHT (Higher scholastic mental capacity)
C					**AFFECTED BY FEELINGS,** EMOTIONALLY LESS STABLE, EASILY UPSET (Lower ego strength)		**EMOTIONALLY STABLE,** FACES REALITY, CALM, MATURE (Higher ego strength)
E					**HUMBLE,** MILD, ACCOMMODATING, CONFORMING (Submissiveness)		**ASSERTIVE,** AGGRESSIVE, STUBBORN, COMPETITIVE (Dominance)
F					**SOBER,** PRUDENT, SERIOUS, TACITURN (Desurgency)		**HAPPY-GO-LUCKY,** IMPULSIVELY LIVELY, GAY, ENTHUSIASTIC (Surgency)
G					**EXPEDIENT,** DISREGARDS RULES, FEELS FEW OBLIGATIONS (Weaker superego strength)		**CONSCIENTIOUS,** PERSEVERING, STAID, MORALISTIC (Stronger superego strength)
H					**SHY,** RESTRAINED, TIMID, THREAT-SENSITIVE (Threctia)		**VENTURESOME,** SOCIALLY BOLD, UNINHIBITED, SPONTANEOUS (Parmia)
I					**TOUGH-MINDED,** SELF-RELIANT, REALISTIC, NO-NONSENSE (Harria)		**TENDER-MINDED,** CLINGING, OVER-PROTECTED, SENSITIVE (Premsia)
L					**TRUSTING,** ADAPTABLE, FREE OF JEALOUSY, EASY TO GET ALONG WITH (Alaxia)		**SUSPICIOUS,** SELF-OPINIONATED, HARD TO FOOL (Protension)
M					**PRACTICAL,** CAREFUL, CONVENTIONAL, REGULATED BY EXTERNAL REALITIES, PROPER (Praxernia)		**IMAGINATIVE,** WRAPPED UP IN INNER URGENCIES, CARELESS OF PRACTICAL (Autia) MATTERS, BOHEMIAN
N					**FORTHRIGHT,** NATURAL, ARTLESS, UNPRETENTIOUS (Artlessness)		**SHREWD,** CALCULATING, WORLDLY, PENETRATING (Shrewdness)
O					**SELF-ASSURED,** CONFIDENT, SERENE (Untroubled adequacy)		**APPREHENSIVE,** SELF-REPROACHING, WORRYING, TROUBLED (Guilt proneness)
Q_1					**CONSERVATIVE,** RESPECTING ESTABLISHED IDEAS, TOLERANT OF TRADITIONAL DIFFICULTIES (Conservatism)		**EXPERIMENTING,** LIBERAL, ANALYTICAL, FREE-THINKING (Radicalism)
Q_2					**GROUP-DEPENDENT,** A "JOINER" AND SOUND FOLLOWER (Group adherence)		**SELF-SUFFICIENT,** PREFERS OWN DECISIONS, RESOURCEFUL (Self-sufficiency)
Q_3					**UNDISCIPLINED SELF-CONFLICT,** FOLLOWS OWN URGES, CARELESS OF PROTOCOL (Low integration)		**CONTROLLED,** SOCIALLY PRECISE, FOLLOWING SELF-IMAGE (High self-concept control)
Q_4					**RELAXED,** TRANQUIL, UNFRUSTRATED (Low ergic tension)		**TENSE,** FRUSTRATED, DRIVEN, OVERWROUGHT (High ergic tension)

A sten of	1	2	3	4	5	6	7	8	9	10	*is obtained*
by about	2.3%	4.4%	9.2%	15.0%	19.1%	19.1%	15.0%	9.2%	4.4%	2.3%	*of adults*

Name:_____

Comments:

D-12

APPENDIX E

DEBRIEFING QUESTIONS

APPENDIX E

DEBRIEFING QUESTIONS

The same series of questions was used with all aquanauts. All debriefing interviews were done individually, after decompression and before exposure to the press or other interested parties. The interviews were conducted in a quiet and restricted room by one member of the habitability research team. One member of the behavioral observation research team was allowed access to the interviews. All interviews were tape recorded, and were later scored by judges who first were required to demonstrate rating reliability of 85 percent or better on the first three sets of interviews. The tapes and all other instruments were handled in such a way as to maximize confidentiality for the crew members. The content analysis system used by the raters is shown in the latter part of this appendix.

DEBRIEFING QUESTIONS

- WHAT WERE YOUR INITIAL IMPRESSIONS OF THE HABITAT WHEN YOU FIRST ARRIVED?
- HOW DID YOUR IMPRESSIONS CHANGE AS THE MISSION CONTINUED?
- WHAT KIND OF LEISURE TIME ACTIVITIES DID YOU MOST ENJOY IN THE HABITAT? DID YOUR PREFERENCES CHANGE AS YOU STAYED? DID YOU HAVE AN COMPLAINTS OR PROBLEMS WITH RESPECT TO LEISURE TIME FACILITIES?
- WAS THE HABITAT SUPPORTIVE TO YOU IN ACCOMPLISHING YOUR SCIENTIFIC TASKS? (OR, IF ENGINEER, YOUR ENGINEERING ROUTINES?)
- WAS THERE ENOUGH PRIVACY? WAS THERE ROOM FOR SOME INDIVIDUALITY?
- WERE YOU ABLE TO SLEEP WELL? IS THERE ANY WAY YOUR SLEEPING COULD HAVE BEEN IMPROVED? DID YOU NOTICE ANY CHANGE IN YOUR DREAMING WHILE IN THE HABITAT?
- DO YOU HAVE ANY THOUGHTS ON HOW WE COULD MAKE THE TAKING OF THE HABITABILITY FORMS MORE PALATABLE? (INCLUDE PROBES ON STORAGE, REMINDING, AND ON TYPES OF FORMS)
- WHAT DID YOU MISS MOST?
- WHICH WAS YOUR BEST DAY IN THE HABITAT? WHAT MADE IT GOOD? (OR, WHAT WAS A PARTICULARLY GOOD TIME OF DAY IN THE HABITAT AND WHAT MADE IT GOOD?) WHICH WAS YOUR WORST DAY? WHAT MADE IT BAD? HOW COULD THE HABITAT HAVE BEEN MORE SUPPORTIVE ON EITHER OF THESE DAYS?
- DID THE TOPSIDE CREW FUNCTION SUPPORTIVELY FOR YOU? THIS AS YOU PROBABLY KNOW HAS BEEN A PROBLEM IN SOME ISOLATED HABITATS. DO YOU HAVE ANY THOUGHTS ON WHAT MAKES FOR A GOOD RELATIONSHIP WITH TOPSIDE?
- DID YOU HAVE ANY PROBLEMS IN THE AREA OF FOOD STORAGE AND SUPPLY? WASTE AND SEWAGE DISPOSAL? COMMUNICATIONS?
- DID YOU NOTICE ANY ALTERATIONS IN YOUR STATE OF CONSCIOUSNESS AT ANY TIME DURING THE MISSION?

Code number_____

Rater_____

Check the appropriate line.

(1) Were your initial impressions?

negative_____

ordinary_____

posh, luxurious, fancy_____

(2) As time went by, did impression change?

more things started bugging me_____

no real change_____

appreciated the habitat more and more_____

(3) What kind of leisure time facilities did you most enjoy?

TV_____

spoken arts_____

books_____

games_____

watching the TV monitor_____

audio tapes_____

(4) Was the habitat supportive of scientific research?

definitely_____

a place to work_____

interfered_____

(5) Was there enough privacy?

yes_____

no_____

(6) Did you sleep well?

yes_____

no_____

(7) Did you dream?

a lot_____

normal_____

less than usual_____

(8) Attitude toward habitability forms

quite negative_____

accepting as a necessary evil_____

(9) What did you miss most?

ice cream_____

wife and family_____

the sun_____

the horizon_____

other (specify)_____

(10) Attitude toward topside

positive_____

split or neutral_____

negative_____

OVERALL

5 excellent, 3 average, 1 poor

Enthusiasm for project_____

Professionalism_____

Liking of diving_____

Would you like him as your teammate in an isolated environment?_____

Warmth_____

Sense of humor_____

Stability_____

Biological support

Food/drink_____

Food quality_____

Food supply_____

Water quality_____

Water supply_____

Food scheduling_____

Utensil problems_____

Equipment problems_____

Waste disposal_____

Too much waste_____

Disposal transfer topside problems_____

Disposal container problems (odors, size)_____

Head problems_____

Sleep_____

Bed comfort_____

Sleep interference_____

Insomnia_____

Hard to get up_____

Physical problems_____

Ear trouble_____

Healing problems_____

Hearing problems_____

Task support_____

Working area_____

Storage_____

Equipment_____

Educational and informational_____

Access to news_____

Clocks_____

Recreational, leisure time_____

Variety_____

More say in what's there_____

Social and communication_____

Topside_____

Slow in meeting request_____

Not doing request_____

Not supplying adequate information on situation_____

Not following prescribed routine in some situation_____

Not competent in knowing or repairing systems_____

State of mind_____

Absentminded_____

Lonely_____

Anxious to get out_____

Diving_____

Rebreather problems_____

Tank filling problems_____

Inadequate supply of equipment_____

Tanks, regulators not functioning well_____

Ladders

Too slippery _____

Awkward_____

Poorly located_____

WR ladder loose_____

Temperature_____

Noise_____

Color_____

Odors_____

Portholes_____

Others in crew_____

Not getting along_____

Leader overexerting authority_____

Crew not following orders_____

Management_____

Unresponsive to suggestion_____

Poorly organized_____

Lack firm hand_____

More briefing and training needed for crew and topside_____

Allowing visitors to overly interfere_____

Not being organized, communicative or careful about DDC_____

Storage_____

Pots_____

Poor quality_____

Big pot hard to manage_____

Too consuming_____

Came at bad times_____

Miscellaneous_____

APPENDIX F

REFERENCES

APPENDIX F

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